Federation of Rhodesia and Nyasaland

REPORT

of the

SECRETARY

to the

FEDERAL MINISTRY OF AGRICULTURE

For the Year ended 30th September, 1962

Presented to the Federal Assembly
1963

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REPORT OF THE SECRETARY TO THE FEDERAL MINISTRY OF AGRICULTURE

(which includes the Economics and Marketing Branch, the Departments of Research and Specialist Services, Conservation and Extension and Veterinary Services).

FOR THE YEAR ENDED 30th SEPTEMBER, 1962.

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CONTENTS

Page No.

1. Report of the Secretary for Agriculture 1

2. Economics and Marketing Branch 14

3. Department of Research and Specialist Services:
    - Crop Production 20
    - Animal Husbandry 23
    - Dairying 27
    - Poultry 36
    - Pasture Research and Ecology 41
    - Botany, Plant Pathology and Seed Services . . 46
    - Chemistry and Soil Science 55
    - Entomology 65
    - Horticulture 74
    - Agricultural Experiment Station, Salisbury . . 78
    - Eastern Highlands Research Station, Melsetter 83
    - Gatooma Research Station 88
    - Grasslands Research Station, Marandellas . . 94
    - Henderson Research Station 97
    - Matopos Research Station (including Nyamandhlovu and Tuli Stations) 105
    - Rhodes Inyanga Orchards 110
    - Sabi Valley Experiment Station 117
    - Gwebi Agricultural College 125
    - Chibero Agricultural College 129

4. Department of Conservation and Extension . . . 135
    - Appendices I to X 168

5. Department of Veterinary Services:
    - Veterinary Field Branch 183
    - Veterinary Research Branch 193
    - Tsetse and Trypanosomiasis Control Branch . 200
    - Appendices I to IV 216

Report of the Secretary to the Federal Ministry of Agriculture

The Year 1961/62 has been a momentous one in many respects. As far as agriculture is concerned, its potential as a means of providing employment and of earning foreign exchange, both through exports and import substitution, has received a marked recognition. This has been due to the fact that other sections of the economy have not been able to provide sufficient employment opportunities to absorb all work seekers, and to the pressing necessity to increase the standard of living of the bulk of the population, most of which relies upon subsistence agriculture for a livelihood.

Last year I reported that agriculture, particularly in the subsistence sector, must play an increasing part in the development of the Federation and I drew attention to its enormous potential. I am even more strongly of this opinion today.

During the year the Federal Government published its "Principles of Economic Policy" (Fed. 218), which outlined the principles to be observed in planning development so as to obtain maximum results from available resources. The agricultural sector will be placed in the highest category of priorities. In addition the Northern Rhodesia Government has published its "Report of the Rural Economic Development Working Party" 1961, and the Southern Rhodesia Government set up a high-level committee under the chairmanship of Professor John Phillips on "Development of the Economic Resources of Southern Rhodesia with particular Reference to the Role of African Agriculture", whose report was recently published. Both these publications lay emphasis upon the urgency of stimulating development of the rural areas of the Federation.

Against this background it is interesting to note the place of agriculture in the economy as a whole. Since 1955 the value of agricultural production has increased as follows:

	Total (£ million)	*Tobacco*	*Maize*	*Cattle Slaughtered*	*Other*
1955	49·5	23·5	9·0	5·7	11·3
1956	60·2	26·4	12·9	6·0	14·9
1957	62·4	27·0	13·1	7·2	15·1
1958	58·1	26·3	9·2	7·7	14·9
1959	66·6	30·2	10·7	9·2	16·5
1960	72·2	34·4	9·9	9·5	18·4
1961	82·2	35·3	14·8	10·4	21·7

As a proportion of the Gross Domestic Product the position of agriculture has remained fairly constant, as the following table which also includes the contribution of Mining shows:

	G.D.P.	*Agriculture (£ million)*	*Percentage of Agriculture*	*Percentage of Mining*
1955	413·7	81·5	19·7	28·4
1956	461·5	92·6	20·1	26·7
1957	458·1	93·5	20·4	18·1
1958	455·5	91·5	20·1	14·8
1959	524·3	99·5	19·0	20·8
1960	552·9	100·9	18·2	22·0
1961	561·4	113·7	20·3	19·6

Turning now to the export figures it is notable that, except in the case of tobacco, which has always been an export crop, a move has been made in many lines of agricultural production from a position of internal deficiency to one of surpluses available for export—particularly in maize and beef.

	Total Exports	*Agricultural Products (£ million)*	*% of Total Exports*	*Tobacco (£ million)*	*% of Total Exports*
1955	169·7	34·5	20·3	26·1	15·4
1956	178·9	37·5	21·0	28·3	15·8
1957	152·4	40·7	26·7	28·0	18·4
1958	131·4	38·4	29·2	28·4	21·6
1959	182·8	47·0	25·7	34·2	18·7
1960	200·1	49·7	24·8	37·5	18·7
1961	200·2	60·7	30·3	42·6	21·3

I look forward with confidence to seeing a further increase in both the value and the proportion of agricultural products in our exports.

As regards employment, there are no accurate figures available but it is estimated that about three-quarters of the entire population of the Federation is dependent, either directly or indirectly, upon agriculture for a livelihood. It is therefore evident that an increase in *per capita* earnings will be heavily dependent upon an increase in the economic development of the industry, particularly in what is generally termed the subsistence sector.

Another aspect of major significance has been the interest shown by producers in growing crops alternative to or additional to maize. This, of course, has been due in no small measure to the drop in the maize producers' pay-out. One cannot regard with equanimity this decrease in the price the producer obtains for his maize, but nevertheless the interest shown in diversifying production is most welcome. Large areas of the Federation are suitable for the growing of burley tobacco, cotton, soya beans and groundnuts and the market prospects for these crops are good. It is therefore incumbent on the farmer to plan his production programme with more care than ever before. It is also incumbent upon Government to assist by providing adequate research, experimental and extension services so as to improve the prospects of profitable production of these crops. I cannot over-emphasize how fiercely competitive the export markets are, and our producers must never rest from striving to reduce costs of production to enable their crops to be sold in competition with the rest of the world and at a reasonable profit to themselves.

Farmers' costs of production are a matter of grave concern. It is indeed unfortunate that so much of the reward which should accrue to a farmer as the result of his increasing efficiency and from technological advances should be absorbed by rising costs of the tools of production.

The marketing and pricing arrangements for major crops continue to be kept under constant review. In my opinion marketing and price arrangements will never be static and permanent, except in the short term. As agricultural development proceeds, new circumstances are created, particularly for those crops which are exported, because they compete with the production of other countries and the conditions under which they are marketed, e.g. under support measures in many cases. Policies must of necessity be adjusted to changing circumstances, hence the need for flexibility. The Ministry is alive to this—and, indeed, so is the industry itself. A notable example is maize, where policies adopted to correct a state of internal deficiency have succeeded. This has created a situation—aggravated by the maize overpayment—where the discrepancy between producer pay-out and internal selling price has placed the marketing system under an enormous strain. This is the principal reason why Government has set up a Commission of Inquiry into all aspects of the maize industry and why, in agreement with the R.N.F.U., the Maize Agreement was abrogated on the 30th April, 1962. The cattle industry is forging ahead and to assure its progress without undue complications Government has commissioned an inquiry into it which will start its work in the first half of 1963. The dairy industry has been examined by a Commission and the tobacco marketing system has also, on the iniative of the South-Western Tobacco Marketing Board, been closely examined. All these inquiries have the object of ensuring that policies are kept in line with existing circumstances and have regard to circumstances which can reasonably be expected to arise in the future.

During the year, the Sabi Development Committee was resuscitated under the chairmanship of the Secretary for Economic Affairs. It submitted a report to Government recommending measures for the development of the area. This report has been accepted in principle and steps are being taken to implement it. The Ministry of Agriculture is convinced that the area has great potential and this view is strengthened by the striking development taking place at Triangle and Hippo Valley. When the proposed Chiredzi branch railway line becomes fact it will provide a powerful stimulant to progress there.

After prolonged negotiation the Federal and Northern Rhodesian Governments agreed jointly on a scheme for the voluntary resettlement of farmers in the Eastern Province of Northern Rhodesia along the territory's line of rail or at Mkushi. The scheme is open for a period of two years and basically it provides for a farm-for-farm exchange, under an agreed method of valuation and with both governments providing generous assistance to enable the farmer to establish himself successfully on his new farm. A few farmers have already applied successfully for participation under the scheme and more are expected to do so before the two-year period of offer expires in April 1964. The object of the scheme is to enable those farmers who have been unable to make a success of their farming operations in the Eastern Province, due to the special problems of the area, to re-establish themselves elsewhere in the territory.

Following the assumption by the Federal Government of administrative responsibility for the Northern Rhodesia Land Bank in July 1961, it became necessary to consider the future of the Farmers' Debt Adjustment Board in Northern Rhodesia. This Board was set up by the Northern Rhodesia Government following widespread crop failures in that territory in the 1957/58 season, and its purpose was to prevent the imminent failure of many farmers by providing them with credit facilities to enable them to rehabilitate themselves financially. Extensive technical advice and assistance was also given to the farmers by the Federal Department of Conservation and Extension. An intergovernmental working party, on which the Ministry of Agriculture was represented, was set up to consider future arrangements, and its main recommendations were accepted by the governments with modifications. These were (a) that administrative responsibility for the scheme should be transferred to the Federal Government and the functions of the Board taken over by the Land Bank, and (b) that the scheme should remain in force with certain legislative amendmends to improve administrative efficiency. The first of these recommendations was implemented and the second will be shortly, when the Land Bank Ordinance is amended to embrace the Debt Adjustment Scheme. The Federal Government's objective remains, as before, to rehabilitate those farmers at present under the protection of the scheme, and to work towards a position where it will be unnecessary to take any more farmers under protection.

In the international field, the major item continues to be the outcome of Britain's application to join the European Economic Community. As is well known, the Federation has applied for association. Despite the fact that some of the advantages originally foreseen in an association have been somewhat reduced through the common agricultural policies adopted by the Community, nevertheless association continues to be the aim for the best interests of the Federation.

Terms of trade have continued to move against countries which rely heavily on the export of primary commodities and there is little prospect of improvement in this regard. This is a worry to many countries, including the Federation, and a strong body of opinion is building up that the solution lies in international commodity agreements. This matter stands high on the priority lists of international organizations such as the Food and Agricultural Organization of the United Nations, of which the Federation is an Associate Member.

During the year the Federal Government joined the following international organizations:

1. International Office of Epizootics.
2. International Union for the Conservation of Nature and Natural Resources.

Officials of the Ministry attended meetings of International Agencies of which the Federal Government is a member, as follows:

Agency	*Meetings*	*Date*	*Place*
Inter-African Phytosanitary Organization	6th Meeting	October	Nigeria
C.C.T.A./F.A.O.	Symposium on Weeds	October	Nigeria
F.A.O.	11th Session	November	Rome
C.C.T.A./C.S.A.	Organization of Agricultural Research	December	Nairobi
C.C.T.A.	17th Session	February	Abidjan
F.A.O.	Agriculture Extension Development Centre	February	Arusha
C.C.T.A./I.B.A.H.	"Course on Infertility"	February	Nairobi
F.A.O.	Seed Control, Production, Distribution	April	Rome
F.A.O./E.C.A.	Development Centre on Agricultural Credit for Africa	May	Addis Ababa
International Seed Testing Congress		May	Lisbon
S.A.R.C.C.U.S.	8th Ordinary Meeting	May	Bechuanaland
O.I.E.C.	Epizootics Conference	May	Paris
F.A.O.	35th Session C.C.P. and Joint Session C.I.C.T./C.C.P.	May	Rome
Inter-African Advisory Committee on Animal Health		August	Conakry
Conference of Commonwealth Chief Veterinary Officers		September	London
British Veterinary Association Congress		September	London
C.S.A.	13th Meeting Scientific Council	September	Kenya

In addition the Ministry was represented on delegations which visited Australia (November, 1961) and Hong Kong (May, 1962) in connexion with trade matters.

CROP PRODUCTION

TOBACCO

The tobacco crop continues to play a vital role in the agricultural picture, and production and sale of the various types of tobacco is shown in the table below:

SOUTH-WESTERN AREA

	Total Weight	*No. of Acres*	*Weight per Acre*	*Total Receipts*	*Average Price per lb.*
	(1,000 *lb.*)	(1,000 *acres*)	(*lb. per acre*)	(£1,000)	(*d. per lb.*)
Flue-cured .	230,791	224	1,030	33,623	34·96
Burley (*a*) .	117	N.A.	—	—	—
Turkish (*a*) .	335	N.A.	—	—	—

(*a*) to 30th September, 1962

NORTH-EASTERN AREA

	Total Weight (1,000 *lb.*)	*Total Receipts* (£1,000)	*Average Price per lb.* (*d. per lb.*)
Flue-cured	3,563	502	33·80
Burley	5,566	752	32·43
Southern Fire-cured . .	3,511	301	20·59
Northern Fire-cured . .	21,761	1,808	19·94
Total of Fire-cured .	25,272	2,109	20·03
Sun-cured	4,332	392	21·69
Turkish	N.A.	N.A.	N.A.

The season was generally speaking not specially favourable for tobacco production as there was a mid-season drought in many areas and the Marandellas, Macheke, Headlands and Rusape areas in particular suffered badly.

Production of flue-cured tobacco in the Eastern Province of Northern Rhodesia continued to decline. The tobacco from that area was sold on the Limbe floors.

The declarations of destination of flue-cured tobacco by buyers shows the following allocation of the crop:

SOUTH-WESTERN AREA

	lb.	*per cent.*
United Kingdom	93,664,672	40·59
Australia	3,921,357	1·70
Republic of South Africa . .	2,186,391	·95
Local Market	5,710,717	2·47
Other Markets	125,158,221	54·23
Unallocated	149,412	·06
		100·00

The buyers on the Limbe floors were unfortunately not able to declare the destination of the tobacco purchased.

The United Kingdom remained the principal market for Federal tobaccos but declined from 110 million lb. in 1961 to 94 million lb., and the proportion of the crop declined from 47 per cent. to 41 per cent. The Australian market also showed an appreciable decline, due to the Australian Government's policy of encouraging local production by means of blending or "mixing" regulations. Tobacco is sold in the Federation on completely free auctions and, with competitive conditions prevailing on the world market, the efforts of the Tobacco Export Promotion Council of Rhodesia and Nyasaland to develop new markets are vital to the prosperity of the industry. The Council continued its sterling work and members of the staff toured various parts of the world and did much to stimulate interest in the Federation's tobacco.

The majority of tobacco growers are highly skilled and experienced in producing an excellent crop on the land, but unfortunately often do not make the same success of curing. The season produced rapid ripening of leaf and many farmers had insufficient barn accommodation or labour available to handle the crop. It is estimated that somewhere in the region of 20 million lb. of leaf valued at about £3 million was wasted in this way. It seems that many farmers attempted to grow too large an acreage and, apart from the direct loss of leaf, there was probably loss in quality due to overcrowding in the barns. It is important that a good quality, balanced crop should be produced and that growers should take steps to avoid the wastage of leaf due to lack of curing facilities.

During the year a group of American tobacco officials paid a brief visit to the Federation and valuable discussion on matters of mutual interest took place.

The fluctuation in price levels and the apparent inconsistency of buying patterns on the auction floors in recent years has been a matter of concern to growers, and this led to the appointment by the South-Western Tobacco Marketing Board of a committee of inquiry into the Rhodesia flue-cured tobacco marketing system under the chairmanship of Dr. F. J. van Biljon, with Mr. J. S. Brown, O.B.E. and Sir Leslie Phillips, C.B.E. as members; Mr. H. G. Stonhill was secretary. The committee had wide terms of reference to examine the existing marketing system and it has submitted its report to the Board, which is considering its recommendations.

A revised system of delivery quotas to the auction floors was introduced during the year and growers were generally most co-operative. The system relies on estimates of the growers' crops submitted by them to the Board. A court case revealed that there was a weakness in the legislation in regard to these returns, and amendments to the Act are being introduced to correct this position.

Plans have been made to hold the first World Tobacco Trade Congress and the third international C.O.R.E.S.T.A. Congress in Salisbury next year. This

Congress should do much to publicize the Federation's tobacco industry. The Federal, Southern and Northern Rhodesia Governments are contributing towards the cost of the Congress; the local tobacco industry is also assisting and contributions have been received from other local sources.

There has been a continued interest in the production of cigarette-type Burley tobacco in the Rhodesias, and approximately 70 growers planted 140 acres in the South-Western areas in the 1961/62 season. Prospects for this crop appear to be very favourable and it should prove to be a valuable source of income for farmers in the maize-growing areas who have suffered a considerable reduction in the price of maize. Experimental work on suitable and relatively cheap curing barns is proceeding. Growers received very good prices for their Burley tobacco this season. Buyers continue to display a very keen interest in Turkish tobacco and an interesting scheme whereby green leaf is purchased from Africans and cured under skilled and unified management has been initiated. The firm concerned has established two buying stations where the seedlings are grown and are then distributed to selected African growers who then sell back the green leaf which is cured on the station.

The Elia Salzman organization announced plans to establish a Tobacco Research Institute in Salisbury which should serve a most useful purpose; it is intended to carry out post-sales research into the smoking qualities and chemical and smoke analysis of Rhodesian leaf.

MAIZE

The 1961/62 season was generally favourable for maize. The estimates of European production were 5.9 million bags for Southern Rhodesia and 1.7 million bags for Northern Rhodesia. The acreage under the crop was estimated to be 434,000 acres in Southern Rhodesia and 107,000 acres in Northern Rhodesia. Taking into account estimated deliveries from African growers the Grain Marketing Board estimated a total intake of 7,438,000 bags of white maize from the 1st May, 1962, to the 31st October, 1962. It is now apparent that deliveries have been falling well below the estimates and the lower rate of delivery to the Grain Marketing Board is believed to be due to a greater proportion of the crop being retained on the farm due to the fall in the producer price; to sales outside the Grain Marketing Board (black marketing), arising from the large gap between the producer price and the consumer price of maize; and to the prices of other grains and groundnuts. The incentive to indulge in illegal marketing is particularly strong to the African, as his net price is further reduced because of Territorial levies. The extent to which such marketing has contributed to the recent trends of reduced sales in Southern Rhodesia cannot be estimated confidently because the recent increases in quantities of maize retained by producers compared with previous years have not yet been assessed.

Certain areas of Northern Rhodesia which do not fall within the areas of Grain Marketing Board control suffered from a poor season. There is a danger of shortages in some areas, particularly in the Eastern Province, and relief supplies are being purchased from the Grain Marketing Board. Internal sales by the Grain Marketing Board in Northern Rhodesia have remained constant.

There appears to be a misconception in the minds of many Northern Rhodesian producers that the surplus which has led to lower producer prices was produced solely in Southern Rhodesia. This is quite incorrect and has been disproved by the facts which show that twice during the past five years Northern Rhodesia has had a larger proportionate surplus than Southern Rhodesia.

The export programme has been carried out efficiently. Exports of the 1961/62 crop have been made at f.o.b. port realizations of between 28s. 11⅜d. and 30s. 9⅞d. per bag.

The apparent increase in black marketing and the general uncertainty which has arisen due to the overpayment for the previous year's crop made it obviously desirable to investigate the marketing and price arrangements for the crop. Accordingly the Government appointed a Commission of Inquiry into the maize industry under the chairmanship of Dr. A. W. O. Bock, general manager of the South African Wheat Board, with Mr. J. Ward, Mr. T. Rouse, Professor M. O. Leppan and Sir Leslie Phillips as members. It is expected that the Commission will submit its report in February, 1963.

The Maize Price Agreement was terminated on the 30th April, 1962, and after consultation with producer representatives a producer price of 29s. 7d. per bag was fixed for the 1962/63 intake year. This price includes the cost of the bag as the free bag issue has also been terminated.

This year the Grain Marketing Board will operate a single maize trading account instead of two accounts, one for internal transactions and one for export, as required in terms of section 17 of the Grain Marketing Act. The Board will buy all maize delivered to it at the prescribed price; sell on the internal market at 41s. 9d. per bag (41s. in Northern Rhodesia); export at best; and receive from Government a subsidy of 7s. per bag on 3 million bags which is the estimated level of internal sales, i.e. £1,050,000. Any surplus on trading at the end of the year will be offset against the overpayment and any deficit will be added to it. These arrangements will require ratification by Parliament.

As regards future arrangements for maize pricing and marketing, these will be influenced by the report of the Commission of Inquiry. Against the possibility of some delay, it has been agreed that in the absence of agreement to the contrary, the producer price for the 1963/64 intake will not be less than it could have been had the Maize Agreement not been terminated.

During the year the chairman and general manager of the Grain Marketing Board paid a visit overseas to investigate the market for white maize. They made many valuable contacts, and were able to assess the size of the market and the probable future demand for white maize.

Work on breeding continued and a new double hybrid seed was introduced during the year; high-yielding single hybrids have become available in limited quantities. It has been decided that the Seed Maize Association and the Farmers' Co-op. Ltd., Salisbury, will take over from Government the responsibility for the bulk production and distribution of hybrid maize seed and accordingly Government is to lease out Panmure Farm, which was formerly used for this purpose. Higher yielding varieties will help farmers to reduce their costs of production by obtaining high yields per acre and there can be no doubt that further progress will be made in the years to come. The breeding of suitable hybrid strains of yellow maize for which a larger market exists overseas and of varieties which have a higher oil content for industrial utilization has been commenced. The acreage of seed maize in 1960/61 was 4,600 and sales were 88,000 pockets. 4,556 acres were grown in the 1961/62 season and sales to the end of September were 60,000 pockets. It thus appears that sales of seed maize are unlikely to reach last year's level, and this may indicate a lower acreage of maize in the 1962/63 crop.

Looking to the future, I am confident that maize will continue to be one of our major crops both for internal consumption and for export. I look forward to a substantially lower selling price which will increase local consumption, and through improved seeds, fertilizer techniques and increasing efficiency of production, to higher per acre yields at costs which will permit exports at a profit.

Finally, I would report that ever-increasing interest is being taken in the advantages of handling maize in bulk. This could well assist producers in keeping costs down, and result in more rapid shipment. However, it would involve considerable capital expenditure and the method needs the most careful investigation; a start has been made on this.

SMALL GRAINS

Munga and Kaffircorn (millet and sorghum).—The price of class "A" munga was fixed at 30s. per 200 lb. bag for the 1961/62 crop and the Grain Marketing Board's selling price was 37s. 9d. The price of class "S" kaffircorn which is used for malting purposes was fixed at 39s. and its selling price at 47s. 6d. Class "A" kaffircorn was fixed at 33s. and its selling price at 39s. 3d. There was a considerable increase in European production of kaffircorn; production in 1960/61 was 57,000 bags in Southern Rhodesia and 6,000 bags in Northern Rhodesia. Sales by the Grain Marketing Board also increased but imports were reduced. Estimated production by Africans in Southern Rhodesia together with sales to the Grain Marketing Board were:

Crop Year	*1956/57*	*1957/58*	*1958/59*	*1959/60*	*1960/61*
Intake Year	*1957/58*	*1958/59*	*1959/60*	*1960/61*	*1961/62*
Munga:					
Estimated total production . .	914,796	887,169	818,829	631,141	1,581,000
Deliveries to the Board . . .	48,803	72,626	51,476	14,630	95,722
Estimated retentions	865,993	814,543	767,353	616,511	1,485,278
Kaffircorn:					
Estimated total production . .	505,561	482,266	566,347	343,950	653,000
Deliveries to the Board . . .	19,262	59,091	37,326	32,817	134,238
Estimated retentions	486,299	423,175	529,021	311,133	518,762
Rupoko:					
Estimated total production . .	897,348	917,413	818,281	569,335	461,000
Deliveries to the Board . . .	139,376	40,228	4,674	1,255	7,632
Estimated retentions	757,972	877,185	813,607	568,080	453,368

The Grain Marketing Board carried out preliminary investigations into the possibility of developing an export market in small grains, as it was felt that production of high grade kaffircorn would soon satisfy the rather limited African beer-brewing market. There appears to be little prospect so far as munga is concerned, but provided that a consistently high-quality product can be exported there are prospects for exports of kaffircorn. It will be necessary to establish a good name for the Federation's product. The initial reaction to samples which were submitted to overseas buyers was not favourable because there was no consistency in the variety or quality. On the export markets it is essential that consignments be consistent in these respects. Freight costs will present a problem as they are nearly double the charter rate for maize, and the grain in addition sells at a small discount to maize.

Rupoko (Finger millet).—This crop was decontrolled with effect from the 1st May, 1962, and is no longer handled by the Grain Marketing Board. The accumulated losses of the Board with regard to this crop over the 10 years it was controlled have been written off from Government revenue. There is a keen demand for the crop for brewing purposes and the trade is organizing purchasing channels from the African producers. It is thought that the trade will be in a better position to handle the crop and to fix its prices so as to bring forth the required quantity of the crop from the African reserves than was possible under the relatively rigid limits of control.

Pricing of small grains.—It has generally been agreed that the price relationship between maize and small grains is that the former has a premium of 3s. to 4s. a bag. This applies to selling price and, when worked back to the producer, the return per bag is higher for small grains than for maize. The producer price for maize has declined sharply and in my view this trend of producer prices towards export parity will inevitably have to apply to other crops.

GROUNDNUTS

Groundnut production continues to increase and many European farmers grew small acreages of the crop for the first time during the 1961/62 season. Considerable work is being done in the development of suitable harvesting machinery and a further increase in production can be expected. This increasing interest has been stimulated by the fall in the maize price as well as by the producer price. The local market has a limited demand and disposal of surplus production can only take place on the export market. The effect will inevitably be reflected in the return per bag received by the producer.

A confectionery groundnut export scheme was instigated during the year whereby selected seed merchants were allowed, in terms of the Grain Marketing Act, to purchase farmers' crops, to grade them, to export the higher-grade nuts and to dispose of the lower-grade nuts to the local expressors. With this crop also the importance must be stressed of maintaining a high quality standard, as premium prices can be obtained for nuts suitable for the confectionery trade. The world market prices for expressing-type nuts fluctuates and there is little prospect at the moment for profitable export of this type of nut. The Agricultural Marketing Council recommendations accepted by Government recognize this. They involve the elimination of the "S" grade scheme and new definitions for "A" and "C" grades for the 1962/63 crop. Late in the year under review Government announced a minimum pre-planting price for the 1962/63 crop of 87s. 6d. per bag for a higher quality Class "A" nut.

Crop Year ending 30th September	*Southern Rhodesia*		*Northern Rhodesia*		*Nyasaland*	
	European Production (1,000 bags)	*African Sales (1,000 bags)*	*European Production (1,000 bags)*	*African Sales (1,000 bags)*	*European Production (1,000 bags)*	*African Sales (1,000 bags)*
1958	8	83	—	49	142	
1959	8	52	1	74	154	
1960	10	77	1	116		230
1961	18	180	2	150	55	288
1962 (est.)	18	190	7	191	405	

Towards the end of the year it became apparent that the drop in world prices was affecting the Eastern Province Co-operative Marketing Association in Northern Rhodesia, and the Co-operative accordingly availed itself of the guaranteed market offered by the Grain Marketing Board. Quantities larger than the normal 20 per cent. of the Eastern Province crop were offered to the Grain Marketing Board, which consequently found itself in a position of self-sufficiency for the first time in some years.

With the increasing interest being shown in the production of other oilseeds such as soya beans and the impact of cotton-seed from expanded cotton production, the Ministry is now considering whether any changes in the marketing system are required.

COTTON

This crop has had a very chequered history in the Federation. Production has varied, with declines due either to severe insect pest attacks or to price factors. Production of seed-cotton during the last five years has been—

Crop Year ending 30th Sept.	*Southern Rhodesia*		*Northern Rhodesia*		*Nyasaland*		*Federation*
	European (1,000 lb.)	*African (1,000 lb.)*	*European (1,000 lb.)*	*African (1,000 lb.)*	*European (1,000 lb.)*	*African (1,000 lb.)*	*Total (1,000 lb.)*
1956/57 .	230	4	28	8	692	8,576	9,538
57/58 .	860	57	5	3	1,216	11,026	13,167
58/59 .	943	146	17	—	2,152	19,368	22,626
59/60 .	1,715	260	23	—	2,102	25,030	29,130
60/61 .	2,528	456	47	47	2,078	23,848	29,004
61/62 (*a*)	1,380		220		36,000		37,600

Note: (*a*) estimated

There is a keen interest in the two Rhodesias in developing cotton production. This is due mainly to advances made in the control of insect pests, to the development of the Albar strain and to the decline in the producer price for maize. The increased effectiveness of pest control measures in particular, largely the result of the excellent work under the Cotton Pest Research Scheme operated jointly by the Federal Government, Nyasaland Government and the Colonial Development and Welfare Fund, has resulted in the efficient producer being able to get excellent yields per acre both under rainfall and irrigation conditions.

Production would have to be increased five-fold before local requirements could be met, assuming that all imports of cotton lint, piece-goods, yarn and substitutes such as rayons could be replaced by local production. As the price paid to the producer is related to the world price the crop could be exported if it increased beyond local requirements. It is therefore policy to develop the crop on an economic basis, that is, on price levels related to export parity. The local spinning industry has been adversely affected by a lower demand by the weavers due to competition from imports of cheap yarns. The position of the industry is being kept constantly under review and a considerable degree of tariff protection is being afforded. With increasing prosperity local demand should increase. The spinning industry is one which can use local materials and sell its production on the home market, and thus it is one of great benefit to the economy.

The Agricultural Marketing Council has recommended that the price for the 1962/63 season should be 8½d. per lb. Class "A" and that the grading, especially of the poorer quality cotton, should be tightened up. These recommendations have been accepted by Government.

FRUIT

The deciduous fruit crop produced in the Eastern Districts of Southern Rhodesia continues to expand steadily, and improved grading and packing by the producers is helping to overcome the somewhat illfounded prejudices which have existed in some quarters against the local product. Much, however, remains to be done in this regard and the importance of careful orchard management and the need for care in picking and packing was stressed in the report on deciduous fruit marketing presented by Mr. H. L. Greyling of the South African Deciduous Fruit Board who was asked to advise the Ministry on marketing matters. Government is giving consideration to a marketing scheme for deciduous fruit, but if one is introduced it is important that its cost should not impose an unreasonable burden on the industry. Production of citrus has also expanded, and an increasing proportion of the crop is being exported overseas. During the year import control against supplies of citrus from Portuguese East Africa was introduced.

Banana production is important in the areas which are suitable, and plantings have expanded in the Lusaka area. The Ministry has taken an active part in bringing together growers and the firms interested in importing and ripening bananas, and the ripeners have given an assurance to purchase the local crop. Import control against very low priced imports from Portuguese East Africa will be introduced early in 1963. This protection should stimulate local production and the prospects for development of the crop appear to be good. Growers should realize, however, that the intention of import control is to give protection against importations at unreasonably low prices; the protection may not be used to increase prices.

POTATOES

Potato production increased slowly during the year and no imports were necessary into Southern Rhodesia. Limited imports were admitted between seasons into Northern Rhodesia. During 1961, 3½ million lb. weight of ware potatoes were imported, whereas 1.7 million lb. weight were imported in the eight months up to August, 1962. No further action was taken in regard to the introduction of controlled marketing of potatoes in Northern Rhodesia as very little support for this measure was received.

RICE

The Nyasaland rice crop was once again disappointing and import permits have been issued to meet the shortfall in the Federation's requirements. There appears to have been some breakdown in the distribution of rice, and merchants have complained of long delays and failure to fulfil orders. The Ministry has had great difficulty in obtaining timely and reliable information of the Nyasaland supply position.

SUGAR

Sugar production continues to increase and new mills were erected at Hippo Valley and Triangle Estates. The Ministry of Commerce and Industry appointed a Commission of Inquiry to investigate the sugar industry during the year, and the report is expected shortly. The estates are voluntarily restricting their production under quota arrangements, as the Federation was unsuccessful in obtaining any quota under the Commonwealth Sugar Agreement. The Ministry places importance on the availability of cheap sugar to industries that process agricultural products, and is anxious to know the Commission's recommendations in this regard. The country also imports considerable quantities of jams, canned fruits and condensed milk, much of which could very well be produced locally if sugar were available at the right price.

VEGETABLES

Imports of fresh vegetables continued to decline, being valued during 1961 at £30,049 and in the eight months up to August, 1962 at £26,119. Much of these were consigned to Bulawayo and Northern Rhodesia. The Agricultural Marketing Council recommended that the 1d. per lb. duty on imports should continue up to the 31st December, 1967, and this was accepted by Government subject to review. Experimental work on vegetables is being carried out at the Henderson Research Station and the Horticultural Advisory service is being strengthened.

Early in the year a major blow was experienced by growers in the Cashel area when Liebigs closed their canning plant there. This followed shortly after the closure of the Chipinga factory, and will undoubtedly have effects on the location of production of canning produce in the Eastern Districts.

WHEAT AND BARLEY

There has been little significant change in the local production of wheat although progress has been made in breeding suitable winter varieties. A few farmers grow this crop under irrigation and very satisfactory yields have been obtained. Yields in the Sabi Valley have been somewhat disappointing to date and it is obvious that more breeding work will be necessary before this crop can take its proper place in the economics of any large-scale irrigation projects in that area. Bird damage is a problem and control measures will be necessary.

Barley is produced on contract with the breweries but the malting capacity is insufficient to meet the requirements of the brewing industry and the Ministry would very much like to see these facilities expanded. To this end discussions are taking place with the breweries in order to provide this necessary stimulus to the development of local barley production.

OTHER CROPS

Coffee.—Coffee continues to thrive in the Eastern District of Southern Rhodesia and further plantings have taken place. A coffee specialist is to be appointed shortly to assist producers in overcoming their problems in both production and processing. Considerable interest in the crop has been shown by overseas buyers and provided the quality remains satisfactory, marketing is unlikely to be a difficult problem.

Soya Beans.—There was considerable interest in this crop during the past season, although in some cases yields were disappointing. Buyers, particularly from the Far East, have shown interest in buying from the Federation and the crop should be a very useful one. Work on suitable varieties and cultural techniques is being pursued.

Sunflowers.—With the guarantee that local expressors will purchase the local production, more interest was shown in this crop, and there can be no doubt that crops such as sunflowers, which have for years been regarded very much as a sideline, will take a more prominent place on Rhodesian mixed farms in future.

Castor Beans.—This crop proved satisfactory in the medium rainfall areas, although the experience of individual growers varied. There is a very good market for the oil and the local product is replacing imports for such uses as medicines and brake fluid.

Tea.—This crop continued to make satisfactory progress and prices, although somewhat less than last year, were not unsatisfactory.

Onions.—Local producers of onions are protected by import control during the period when the local crop is on the market. Production is adequate to meet local requirements from August to January.

PASTORAL PRODUCTION

CATTLE

The cattle industry continued to develop during the year and the prospects continue very favourable.

As reported last year, the Cold Storage Commission carried forward an operating loss of £310,093 at the end of the 1960/61 financial year. However, it is expected that a small profit will be disclosed for the 1961/62 year, although audited figures are not yet available.

During the year, the Cold Storage Commission was authorized to increase its overall selling prices by an average of 1d. per lb. This was necessary in order to avoid another loss being incurred.

The following table shows the Cold Storage Commission's Southern Rhodesia slaughterings for their financial years 1960/61 and 1961/62.

Grade	*1960/61* Weight (1,000 lb.)	*1960/61* Per cent.	*1961/62* Weight (1,000 lb.)	*1961/62* Per cent.
Rhodesia's Best . .	2,668	2·73	3,902	3·55
Imperial	8,129	8·31	8,544	7·77
Standard A . . .	25,697	26·27	32,538	29·61
G.A.Q.	34,086	34·84	37,684	34·29
F.A.Q.	14,719	15·05	16,140	14·69
Compound . . .	10,428	10·66	9,560	8·70
Inferior	2,097	2·14	1,534	1·39
TOTAL . .	97,824	100·00	109,902	100·00

In the last few years the pattern of delivery of animals for slaughter has shown an appreciable change both in regard to grades and seasonality. This has affected the operations of the Commission, and has necessitated changes in the producer price schedules to encourage a more desirable flow position. The changes have been deliberately made gradually, as cattle production is a long-term venture and sudden major changes in prices would be disruptive. It can be expected that the grade price schedule will be subject to continuing adjustment to meet changing circumstances.

Exports of beef have continued to the United Kingdom and represent approximately 10 per cent. of total production. A proportion of the exports were in the form of tinned beef and extracts and the latter totalled 679,163 lb., valued at £319,737, during the period July 1961 to June 1962. Tinned meat exports during the same period last year were 9,240,875 lb. valued at £1,500,955. Exports of frozen beef for 1961/62 totalled 9,425,762 lb. valued at £723,916 and exports of chilled beef 11,798,364 lb. valued at £839,922. The former figure was slightly lower than for 1960/61, but the latter showed a considerable increase. Rhodesian beef is becoming increasingly well known at Smithfield and some consignments in particular have received very favourable mention. Representatives of the Cold Storage Commission went overseas during the year to examine the market position and made valuable contacts.

The Federation has to ship its beef exports through South African ports, and the South African Perishable Products Control Board, which is responsible for the allocation of refrigerated shipping space, has given the Federation's exports very considerate treatment. There can be little doubt, however, that as exports develop shipping space will become an increasingly important factor. The development of exports will require careful planning and attention to detail, particularly as to attractive presentation, hygiene and veterinary considerations.

The following tables reveal the steady growth of the industry—

CATTLE HOLDINGS IN THE FEDERATION
(*thousand head*)

	Federation		*Southern Rhodesia*		*Northern Rhodesia*		*Nyasaland*	
	European-owned	*African-owned*	*European-owned*	*African-owned*	*European-owned*	*African-owned*	*European-owned*	*African-owned*
1957 . .	1,600	3,190	1,434	1,981	155	892	11	317
1958 . .	1,687	3,320	1,506	2,074	167	917	14	329
1959 . .	1,747	3,384	1,553	2,087	179	955	15	342
1960 . .	1,766	3,310	1,552	1,964	197	1,006	17	340
1961 . .	1,827	3,417	1,599	1,988	213	1,070	15	359

CATTLE SLAUGHTERINGS IN THE FEDERATION

(Excluding slaughterings in the African reserves for subsistence)

(*head*)

	Federation	*Southern Rhodesia*	*Northern Rhodesia*	*Nyasaland*
1957	330,717	264,355	37,613	28,749
1958	351,545	282,030	40,366	29,149
1959	422,491	345,894	50,359	26,238
1960	445,801	357,395	58,961	29,445
1961	450,674	341,753	76,155	32,766

Accurate statistics covering the three Territories in regard to calving percentage and mortality—indicators of efficiency of management—are not available but the figures for Southern Rhodesia are:

	Calving percentage	*Mortality percentage*
1955/6 . . .	48·4	4·0
1956/7 . . .	51·5	4·0
1957/8 . . .	47·8	4·2
1958/9 . . .	48·1	3·9
1959/60 . . .	44·7	5·3
1960/61 . . .	45·3	3·8

It is obvious that there is considerable scope for improvement on these results. Energetic work is going ahead on the problem, particularly that of improving the calving rate.

A Commission of Inquiry under the chairmanship of Sir Henry Turner reported in 1956, and since then the industry has made great strides. Consideration is being given to the necessity of setting up another commission to take an objective look at the industry, with particular reference to the pricing and marketing angles to ensure that policies are correctly formulated for its further advancement. Early in the year the post of general manager of the Cold Storage Commission was filled by Mr. N. Spoel, a man of wide experience in the meat industry.

SHEEP

There has been an increasing interest in sheep production and the Cold Storage Commission extended its grading scheme for mutton and lamb to the main centres in Southern Rhodesia during the year. The Ministry continues to restrict imports under quota arrangements. There is still considerable room for further expansion of production. The estimated Federal production in 1961 was 2,120,000 lb. whereas imports were 3,559,000 lb.; and it is to be hoped that producers will take steps to provide the whole of the internal demand.

POULTRY

Supplies of dressed table birds were ample during the year and exports to neighbouring territories took place. A Poultry Imports Advisory Committee was set up by the Ministry with a senior officer of the Ministry as chairman, and representatives of the various sections of the industry—breeders, egg and broiler producers—to advise on importations of breeding stock and other matters of interest to the industry generally.

Turkey production increased and the Federation is now self-supporting.

Eggs were in adequate supply throughout the year.

PIGS

The Federation is more than self-sufficient as regards pork products. Indeed, Colcom Products Central Co-operative Ltd., which buys all pigs offered to it within price brackets set by Government, has accumulated large stocks, a good deal of which will have to be exported. Overseas prices are not attractive and it is evident that constant consideration must be given to pricing policies so as to bring production more nearly into line with demand.

Slaughterings over the past three years were as follows:

Year ending September	*Porkers*	*Baconers*	*Manufacturing*	*Total*
1960 . . .	63,588	55,269	4,788	123,645
1961 . . .	49,844	57,229	5,006	112,079
1962 . . .	50,409	62,759	6,967	120,135

DAIRY

The year 1961/62 was generally favourable for milk production although rainfall was erratic in certain areas. Deliveries of milk to the D.M.B. in Southern

Rhodesia rose by about 6.5 per cent. over the previous year, reaching a new peak of 15.2 million gallons, whilst whole-milk sales showed little change at 7,154,000 gallons. In Northern Rhodesia deliveries of milk to the Co-operative Creameries showed an increase of some 63,000 gallons to 2.8 million gallons, but this does not reflect the true position, due to the operation of the "separation on farm scheme" during part of the year. This scheme has now ceased. Taking into account farm separation of milk, deliveries of milk to the creameries have remained fairly constant over the last three years. Whole-milk sales, however, showed a rise of some 112,000 gallons, reaching a level of 1.8 million gallons.

The system of differential prices operated in both Southern and Northern Rhodesia during the year with no changes taking place in respect of the guaranteed prices. These remained at 51.0d. per gallon for the months July to November; 37.0d. per gallon for the period December to February, and 47.0d. per gallon for the months March to June. These prices are paid for milk sold as whole-milk plus a "safety margin" amounting to 750,000 gallons in Southern Rhodesia and 250,000 gallons in Northern Rhodesia. The balance of milk was paid for at its net realization value which amounted to approximately 20.0d. per gallon in Southern Rhodesia and 15.0d. per gallon in Northern Rhodesia. Whereas the guaranteed prices for whole-milk sales would give producers an overall average realization of approximately 46.5d. per gallon, the operation of the Pool Price System has, since 1956, reduced this figure in Southern Rhodesia to approximately 34d. per gallon and in Northern Rhodesia to approximately 37.0d. per gallon. In addition to these overall average pay-outs, producers in Southern and Northern Rhodesia received quality premiums of approximately 1.4 and 1.0d. per gallon respectively.

The main reason for this decrease in pay-out has been the sharp rise in milk production, whilst whole-milk sales have remained fairly constant. The trend of whole-milk production and sales over the past few years is given below:

DAIRY MARKETING BOARD: SOUTHERN RHODESIA

	Intake (*1,000 gals.*)	*Whole-milk Sales* (*1,000 gals.*)	*Surplus* (*1,000 gals.*)	*Surplus as a percentage of intake*
1958/59 . . .	12,379	7,348	5,031	40·6
1959/60 . . .	13,815	7,178	6,637	48·0
1960/61 . . .	14,307	7,162	7,145	49·9
1961/2 . . .	15,236	7,154	8,082	53·0

CO-OPERATIVE CREAMERIES OF NORTHERN RHODESIA

	Intake (*1,000 gals.*)	*Whole-milk Sales* (*1,000 gals.*)	*Surplus* (*1,000 gals.*)	*Surplus as a percentage of intake*
1958/59 . . .	2,867	1,656	1,211	42·2
1959/60 . . .	3,076	1,711	1,365	44·4
1960/61 . . .	2,766	1,688	1,078	39·0
1961/62 . . .	2,829	1,800	1,029	36·4

Note.—The "separation on farm" scheme operated during 1960/61 and 1961/62. It is estimated that this reduced actual milk intake by 265,000 and 128,000 gallons respectively.

Utilization of surplus milk by the Dairy Marketing Board and Co-operative Creameries during 1961/62 was as follows:

DAIRY MARKETING BOARD AND CO-OPERATIVE CREAMERIES
SURPLUS MILK UTILIZATION, 1961/62

	1,000 gallons
Cheese	2,346
Whole-milk powder* and skim-milk powder†	3,859
Sterilized milk	274
Separated for butter-fat and liquid skim-milk	2,353
Other uses and losses	279
TOTAL	9,111

* Whole-milk powder is manufactured by the firm of Nestlés Ltd.

† Butter-fat obtained from separation of whole-milk for powder production and liquid skim-milk is manufactured into butter.

Retail prices for whole-milk remained unchanged in the two Territories and the levy imposed on producer-retailers of milk within the controlled areas of Southern Rhodesia remained at 8d. per gallon.

The negotiations for the takeover of the Co-operative Creameries of Northern Rhodesia were completed during the year and a Federal Dairy Marketing Board came into existence, in terms of a new Dairy Produce Marketing and Levy Act which had come into operation in May, 1962. Regulations under this Act were applied to Southern Rhodesia at this date and to Northern Rhodesia in September, 1962.

The successful drive to increase milk sales to Africans has continued, and skimmed milk is starting to become an important item of diet for an increasing number of urban Africans.

The report of the Commission of Inquiry into the Dairy Industry was presented to Government in November, 1961, and to the Federal Assembly in January, 1962. The major recommendations of the report have been considered by Government, the Rhodesian National Farmers' Union and the Dairy Marketing Board and preliminary discussions have taken place, but no major recommendation had been implemented before the end of the year under review. In general, the report has been accepted by Government and the discussions have been aimed at finding ways to implement it.

C. A. MURRAY,
Secretary for Agriculture.

Economics and Marketing Branch Report for the Year ended 30th September, 1962

THE YEAR UNDER REVIEW saw changes in the functions of the Economics and Marketing Branch as the parallel administrative staff of the Ministry was expanded in numbers, in order to relieve the Branch and its professional officers of a great deal of the day-to-day administrative work in connexion with the implementation of marketing and policy matters, which had formerly accounted for a considerable proportion of the Branch's activities. Administrative officers took over from the Branch in respect of such matters as attending meetings of statutory boards, dealing with import and export controls and the drafting of legislation. In addition, the staff position of the Branch improved considerably. As a result the Branch is now able to afford more time on investigations on the economic aspects of agricultural policy, and to prepare reports of this nature with the degree of detail and thoroughness which is necessary for a proper assessment. This has been perhaps the most important development during the year. Further, the improved staff position has also meant that a more comprehensive programme of field investigational work could be initiated. However, the Branch still did not have its full complement of staff and there were vacancies at both senior and junior levels throughout the year. The post of Senior Agricultural Economist which had been vacant for over a year was filled towards the end of the year by the promotion of Mr. W. D. Mills.

The Branch commenced a cost of production survey on Virginia flue-cured tobacco on behalf of the Rhodesia Tobacco Association, which is bearing the costs of this investigation. The establishment of the Branch has been increased by three professional officers and one clerical officer to handle this extra work, and by the end of the year one professional officer had been appointed and existing staff was being used to initiate the inquiry in the meanwhile. The Branch continued to assist the Department of Conservation and Extension with farm management advisory work, and in addition to the one senior professional officer on secondment, one professional officer assisted for two months of the year. Other members of the Branch attended field days organized by the Department in connexion with the "alternative crops" drive. As soon as the existing vacancies on the Branch's establishment are filled, two professional officers will be seconded to the Department of Conservation and Extension.

The Chief Agricultural Economist continued to be a Registrar of Co-operative Companies and there was an interesting development in the co-operative field in that there was increased interest in agricultural "supply" co-operatives, and several were formed or were about to be formed during the year. These co-operatives have been very active in reducing the cost of certain farming requisites, and the very considerable reductions in prices of pesticides were a notable achievement.

The Chief Agricultural Economist attended the Food and Agricultural Organization (F.A.O.) Conference and also the F.A.O. Committee on Commodity Programmes in Rome. The Senior Agricultural Economist attended an F.A.O. seminar on agricultural credit in Addis Ababa.

The Branch was responsible for the preparation of the Ministry's evidence for the Agricultural Marketing Council, and the chief Agricultural Economist attended all meetings of the Council as the Federal Government observer. In addition to the Agricultural Marketing Council, the Chief Agricultural Economist or members of the Branch's staff served on the following committees: Federal Standing Committee on Agricultural Production; the Sabi Development Committee; the Sabi Development Farm Advisory Committee; the Fruit Imports Advisory Committee; the Trade Agreements Working Party; the Rail Traffic Estimates Committee, and departmental committees on the prospects for coffee, sunflowers and bananas; on the Departmental Industry Committee when agricultural matters were discussed, and the Ministry's Show Committee.

Members of the Branch lectured at Gwebi Agricultural College, at an Induction Course organized by the Public Services Board of Southern Rhodesia, at a Natural Resources Board course on capital and credit for young farmers and at various courses in farm management organized by the Department of Conservation and Extension. The Branch provided assistance to the South-Western Tobacco Marketing Board's Committee of Inquiry into the Rhodesian flue-cured tobacco marketing system. The Commission of Inquiry into the Dairy Industry had been furnished with a considerable amount of statistical and other assistance earlier in the year. This assistance involved the full-time secondment of the officers concerned for the periods of the inquiries. Information was also provided for the Commission of Inquiry into the Sugar Industry. The Branch prepared monthly marketing reports on prices and market conditions, and prepared information on prices of fruit and vegetables twice weekly for the press and radio.

The Branch had a full programme of costs of production inquiries during the year:

Milk Costs Survey.—Data for the third year was collected and analysed and the drafting of the final report was well in hand.

Tobacco Costs Survey.—This survey is being carried out for the R.T.A. and work commenced on obtaining records from approximately 100 tobacco farmers for the 1961/62 season and 300 (10 per cent. of all growers) for the 1962/63 season. An initial report should be available by March, 1963.

Cattle Costs Survey.—The first year's results were collected and a start was made on collecting the second year's results. A report covering the two years' results should be published early in 1963.

Maize Costs Survey.—The scheduled three-year costing will start again for the 1962/63 season and preliminary contact with approximately 100 farmers commenced at the end of the year.

Farm Management Survey.—The data available in the Branch as a result of the various costs surveys were tabulated and a report will be published shortly. The investigation into the economics of fruit and vegetable farms in the Eastern Districts of Southern Rhodesia was continued and it is hoped to enlarge the survey in the coming year.

Poultry Survey.—An investigation into the poultry industry, both from the aspects of the economics of production and the problems of marketing, was instigated during the year and should provide interesting information about the industry.

In view of the increasing interest in alternative crops to maize the Branch conducted small-scale surveys into the direct cost of producing groundnuts, castor beans and soya beans for the 1961/62 season, and reports on these investigations will be available shortly.

The Branch is indebted to all farmers who have co-operated, completely voluntarily, in these inquiries. Their assistance has been invaluable.

The Economist on secondment to the Department of Conservation and Extension concentrated on training senior extension staff in the techniques of farm management analysis. During the year, work commenced on the formation of Management Discussion Groups of farmers throughout the country. The techniques of recording for management purposes were publicized during the year by a series of publicity articles in the *Rhodesia Agricultural Journal* and by talks to groups of farmers.

The Branch maintained its office in Lusaka, though it proved impossible to station an officer permanently there. Frequent visits were made by senior staff, and liaison with the Northern Rhodesia Government, the Department of Conservation and Extension and others continued.

L. URIBE,
Chief Agricultural Economist.

Department of Research and Specialist Services Report for the Year ended 30th September, 1962

STAFF

Last year in the annual report attention was drawn to the staff position, which was giving cause for considerable disquiet. At the time the report was written there were twenty-two departmental vacancies. Subsequently the Department gained ten new posts in the current Estimates, and very strenuous efforts were clearly necessary to attract and hold suitable officers. It was hoped that the report on the Rous inquiry into conditions of service—then under way—would be rapidly completed and that it would contain recommendations which would make a career in the Federal scientific service, and particularly research, more attractive than clearly it had become.

It is essential, if the very fine work that has been done in this country in the past is to be carried on and expanded, not merely to be able to recruit men, but to be able to attract applicants of calibre and of real aptitude for research. Such men are rare and the worldwide demand for them increases all the time. At the end of the year under review there is the likelihood of a public announcement being made any day about new terms and conditions of service.

Curiously enough, towards the end of the year, although there seems to be nothing possibly to account for it and our press overseas is as bad as ever—and as badly misinformed—there has seemed to me to be a distinct improvement, not only in numbers but in quality, in applications for employment. Although the statement of our staff position still reflects a depressing number of vacancies, many posts have in fact been offered to suitable candidates of whom a considerable proportion are likely to accept. The general staff position is outlined in the following table:

Establishment:

Superscale Posts	18
Senior Professional Officers	43
Professional Officers	65
Farm Superintendents	3
Farm Managers	6
Farm Assistants	1
Field Staff	1
Senior Technical Research Officers	3
Technical Research Officers	6
Technical Maintenance Officer	1
Senior Instructors	6
Instructors	5
Senior Stockmen	4
Stockman	1
Technical Assistants	35
Senior Milk Recorder	1
Milk Recorders	10
Senior Plant, Fruit and Grain Inspector	1
Plant, Fruit and Grain Inspectors	4
Chief Meat Grader	1
Senior Meat Graders	4
Meat Graders	10
*Other Posts	6
Contract Posts	3
Higher Executive Officers	2
Clerical/Typists	31
African Posts—Branch III	39
African Posts—Branch IV	46
Total	356

**Other Posts.*—1 Curator (Botanical Gardens), 1 Warden/Librarian (Chibero), 1 Handyman (Henderson), 1 Groundsman/Handyman (Gwebi), 1 Senior Matron (Gwebi), 1 Assistant Matron (Gwebi).

Resignations:

Senior Professional Officers	2
Professional Officers	4
Senior Instructors	2
Farm Assistant	1
Milk Recorders	3
Meat Grader	1
Technical Assistants	8
Clerical Posts	11
Total	32

Transfers:	*From Dept.*	*To Dept.*
Senior Professional Officer	1	—
Professional Officers	2	1
Technical Assistants	3	1
Milk Recorder	—	1
Senior and Technical Officer	—	1
Clerical	6	4
TOTAL	12	8

Appointments:	
Professional Officers	12
Contract	2
Technical Assistants	17
Milk Recorder	1
Meat Graders	2
Other Posts (Curator)	1
Farm Assistants	1
Clerical Posts	9
Branch III	3
TOTAL	28

Vacant Posts:	
Superscale Post	1
Senior Professional Officers (including 1 contract post)	3
Professional Officers	12
Technical Assistants	4
Clerical	1
Farm Assistants	1
Branch III	1
TOTAL	23

AGRICULTURAL RESEARCH COUNCIL

The programme of the Agricultural Research Council has been discussed and clarified a great deal since my last report. A library service has been set up by the Council which enables all research workers in the Federation to obtain micro-copies of papers they wish to read. The Council has placed four readers at the disposal of the Department and these have been distributed to distant stations. A Chief Biometrician has been appointed and after a study and familiarization course with the latest equipment at Rothamsted is about to assume duty. Three teams have been agreed on which are of particular concern to this Department. The first is a soil fertility team for which laboratories are now being planned at Grasslands Research Station. The only two members who have so far been recruited are Dr. Saunder and Dr. Grant, both members of the Chemistry Branch of this Department who have been seconded to the Council for this important work. Dr. Saunder will be the head of the team. Actual work at Grasslands in this unit is unlikely to begin before late next year.

An animal nutrition unit is also in the process of being formed, following consultations and discussions with world authorities. The greater part of the team will be stationed at Mt. Makulu in Northern Rhodesia, but one biochemist (of the two proposed) will work at Henderson Research Station in the closest association with the animal husbandry section there.

The third team which will be stationed at the Matopos Research Station, will deal with bush encroachment and bush control. The work—of a fundamental nature—will be closely associated with the large-scale, diversified and complex investigations on veld management and bush control which have been going on at Matopos (and other stations) for many years. Some little delay is likely in the setting up of this team and it is hoped that in the interval the writing up of the Matopos work, and the sorting out of a mass of accumulated data, which are now under way, will contribute to a clarification of the basic problems and the success of the team approach.

The mechanism by which all these projects were discussed in relation to the needs and facilities of Federal agriculture was provided by the creation of an Agricultural and Animal Husbandry Consultative Committee. On the recommendation of the Federal Standing Committee on Agricultural Production this Agricultural Research Council Consultative Committee was formed from the Federal Research Advisory Committee—which will itself continue its functions in its own limited field—by the addition of tobacco and animal health and husbandry representation. Both committees are under the chairmanship of the Director, Research and Specialist Services. The Consultative Committee has met on several occasions, to discuss the proposals of the Director of the Agricultural Research Council for the different team projects, to recommend on the siting of the teams and to suggest procedures by which the programmes for the agreed projects should be given a full, representative and national purpose. What has been agreed is that, before the research policy of any team is formulated, a conference of all experts within the particular subject of study (not only throughout the Federation, but if desirable, from outside it) will be held, to go into the matter in the greatest detail and to suggest the lines which basic work should follow.

Another development which is approaching fruition is the publication, by the Council, of a *Rhodesian Journal of Agricultural Research*. An editorial committee has been formed and has met to formulate policy and discuss all the multitudinous details involved in bringing out a new scientific journal. There are three representatives of this Department on the editorial committee, including Dr. Saunder. The editor of the journal will be Dr. Pereira. The proposal that the Council should undertake the publication of such a journal—a proposal which the Council welcomed—came in fact from this Ministry at a time when the policy regarding the *Rhodesia Agricultural Journal* had reached a crossroad, and when the claims of a scientific publication and the necessity for more popular dissemination of agricultural information were likely to conflict.

RESEARCH

The annual policy meeting of the Department, attended by all heads of Branches, Stations and Agricultural Colleges, was held towards the end of September, and proved very informative and rewarding. The meeting was addressed at some length by the Secretary for Agriculture on the Ministry's attitude to various questions and the Ministry's wishes and policy for the future. This full discussion of important matters was greatly appreciated by the senior officers concerned.

As had been agreed the previous year, nearly all visits by the Departmental Research Advisory Committee to stations in August and September were discontinued, and were replaced by visits during the rains. In spite of the fact that on each occasion the rain came down in torrents, it was agreed that the timing was very much better. The only visit made in September was to the cattle and pasture work at Matopos.

FEDERAL STANDING COMMITTEE ON AGRICULTURAL PRODUCTION

This important committee which includes the directors of the territorial departments of agriculture, economists, other senior scientists and administrators, met several times during the year to discuss a wide range of subjects. One meeting was held at Chibero and another, following a visit to the Polder, at Lusaka. As in previous years the discussions included agricultural policy, research, education and all aspects of increased rural development and the goal of a cash economy.

ITEMS OF SPECIAL INTEREST

Among the events of the past year which deserve mention was the official opening of Chibero Agricultural College by His Excellency the Governor-General, a glittering affair, which fell on a day of intense heat. Another event of significance in the agriculture of the country was the building and shortly afterwards the operation of the legume inoculant factory at Grasslands Research Station, which, under Mr. Corby, will make for commercial distribution cultures of the rhizobia which intensive work has isolated and selected for maximum efficiency. Grateful acknowledgement is made to the Farmers' Co-operative Ltd., Salisbury, for a generous and farsighted donation of one thousand guineas towards the cost of equipping the factory. The reorganization of the work at Rhodes Inyanga Orchards which, aided by a Growers' Liaison Committee, has been in the planning, preparatory stage for several years, is reflected in new experimental orchards under irrigation, comprising some of the most extensive and comprehensive field experimentation in deciduous fruit in the world. The preparation and planting of the site, its fencing and the delivery of water to it along a tortuous cliff-hanging ancient furrow reflect great credit on all concerned and I would like in this connexion to make special mention of Mr. Pauls who, brought up from Matopos to help, performed prodigies of mechanical and engineering improvisation.

A later section which shows visits by officers of this Department outside the Federation reflects our continuing desire for selected officers to take higher degrees, if desirable beyond our borders, and for others to improve their knowledge and experience, or even, as in the case of the Chief Horticulturist, to achieve a new expertise. This section also reveals the part the Department plays in pan-African and world organizations and it is significant in this connexion that one of our senior specialists has chaired important inter-African Conferences.

For my part my study tour of research organizations in South Africa and my discussions with senior officers there on the administration of research proved of extreme value. More such tours by senior officers, at fairly regular intervals, are I believe highly desirable; they achieve results out of all proportion to the time and expenditure involved.

Panmure Hybrid Maize Station was closed towards the end of the year.

COMMITTEES AND BOARDS

Attendance at committee meetings, frequently as chairman, with the essential preparatory work that involves, takes up much of the time of the Director. Such attendance is, however, an integral and indispensable part of the administration of agriculture, and of the necessary representation of every contributory point of view. The committees and boards attended by the Director were as follows:

- Federal Standing Committee on Agricultural Production (Chairman).
- Federal Research Advisory Committee (Chairman).
- Departmental Research Advisory Committee (Chairman).
- Fertilizer Advisory Committee (Chairman).
- Agricultural Research Council.
- Agricultural Research Council Consultative Committee on Agronomy and Animal Production (Chairman).
- Agricultural Research Council Editorial Committee, *Rhodesian Journal of Agricultural Research*.
- Tobacco Research Board.
- Seeds Research Advisory Committee (Chairman).
- Scientific Advisory Committee.
- Committee on Irrigation and Drainage.
- Rhodes Inyanga Orchards Liaison Committee (Chairman).
- Sabi Valley Development Committee.
- Committee of Inquiry into growing of Yellow Maize for Export (Chairman).

Senior officers of the department served on numerous interdepartmental and other committees.

VISITS OUTSIDE THE FEDERATION

The following officers attended various meetings and conferences or participated in study tours:

Dr. B. S. Ellis made visits to various centres in the Republic of South Africa.

Mr. J. C. Raath returned from an F.A.O. Fellowship to England, the Continent and the United States of America (reported last year) and later visited Pretoria as the Federal Government representative on the Pig Testing Centres' Committee of South Africa.

Mr. P. A. Donovan was selected to fill the vacant post of Chief Horticulturist and left to undergo intensive training at various centres in the Republic of South Africa. After visits to various parts of the Federation he will gain further experience in South Africa, and possibly in Israel.

Dr. D. H. Saunder visited Kenya to attend a specialist meeting on Applied Meteorological Research held at Maguga, and a Conference of Research Workers on Soil Science. Dr. Saunder read a paper at this latter meeting. He visited the East African Agricultural and Forestry Research Organization and Laboratories at Maguga, also the Scott Agricultural Laboratories at Nairobi, and the Coffee Research Station at Ruiru. He also visited the catchment area hydrological experiments at Kimakia.

Dr. G. R. Bates attended the 6th meeting of the Inter-Africa Phyto-Sanitary Commission at Ibadan, Nigeria, as the official representative of the Federation, and subsequently attended the C.C.T.A./F.A.O. Weeds Symposium at the same venue, where he took the chair. He attended the CCTA/CSA Symposium on the Organization of Agricultural Research, representing the Ministry, at Maguga, Kenya, in December, 1961. He attended the 17th Session of the CCTA at Abijan in February, 1962, as a member of the Federal delegation and took part in discussions on various matters. He attended the 13th meeting of the C.S.A. at Maguga, Kenya, in September, 1962. On both trips to Maguga, visits were made to Ruiru Coffee Research Station.

Mr. W. E. Kerr attended the F.A.O. Technical meeting on Seed Production, Processing and Distribution in April, 1962, and then went on to the International Seed Testing Association Congress at Lisbon.

Dr. P. Grant visited various centres in and around Durban for information regarding working methods and equipment that could profitably be applied in our Chemistry Branch.

Mr. T. H. Vorster returned from an extended visit to Stellenbosch University where he had been analysing and writing up some of his major work at Matopos (reported last year).

Mr. G. L. Lloyd returned from a Ford Foundation Scholarship in the U.S.A. after studying Poultry Genetics (reported last year). He was awarded his M.Sc. for his studies.

Mr. G. C. Martin visited Pretoria and Johannesburg for exchange of views with the Nematology Section of the Department of Agriculture, Pretoria, and to examine a Zeiss Photo-microscope which the Entomology Branch were contemplating purchasing for his work. This instrument has since been purchased.

Mr. K. E. Cackett visited Mauritius to attend the 11th I.S.S.C.T. Congress tour. Visits were made to the Mauritius Sugar Industry Research Institute at Reduit, and to many stations on the island. He also attended technical sessions at Reduit.

Mr. T. C. D. Kennan visited India and Australia on an F.A.O. Fellowship to study all aspects of range and veld management.

SECTIONAL REPORTS

There follow the annual reports on the branches, stations and agricultural colleges which together constitute the Department, and also a report on crop production.

CROP PRODUCTION

SEASONAL CONDITIONS

The 1961-62 rainy season was one of extremes, of tremendous contrasts and of cyclonic activity. After the usual preliminary showers in October the rains started over most of the country on or about the 5th November, and November rainfall totals were well above average. In Southern Rhodesia, particularly the Midlands, the December rains failed to materialize. Those of January were improved by one or two of the major advances of air into the country but in February and March rains were again poor. In sharp contrast to such conditions were the heavy falls associated with the cyclones which came inland—"Daisy" in January and "Gina" in February—affecting the east and south-east of Southern Rhodesia. In the case of "Kate", rainfall was excessively heavy. Farm dams which had been half empty throughout the season, filled overnight. April was showery with sunshine spells between showers.

THE MAIZE CROP

Estimate of Yields

The final forecast of the European-grown maize crop in Southern Rhodesia was approximately 5.9 million bags from 434,000 acres. This represented an average yield of 13.5 bags an acre which was about one bag an acre less than the record yield of 14.4 bags an acre for the 1960-61 season. The average yield per acre was the second highest on record.

The acreage planted was the largest for the past twelve years as the following table shows:—

Season	*Number of Growers*	*Area Planted*	*Crop Reaped*	*Yield per Acre*
1950–51	3,916	343,521	1,176,528	3·42
1951–52	4,095	361,521	2,454,047	6·80
1952–53	4,176	363,204	2,360,011	6·50
1953–54	4,154	359,709	2,678,314	7·50
1954–55	4,170	364,059	2,734,920	7·51
1955–56	4,087	342,509	3,434,797	9·74
1956–57	4,162	371,062	3,777,021	10·2
1957–58	3,997	349,270	3,589,600	10·3
1958–59	4,000	340,000	3,500,000	10·3
1959–60	4,029	350,000	3,080,000	8·8
1960–61	4,250	375,000	5,400,000	14·8
1961–62 (estimated) .	4,451	434,000	5,900,000	13·5

HYBRID SEED MAIZE

The hybrid maize crop produced during the past season was the fourteenth grown by members of the Rhodesia Seed Maize Association.

Sales of double hybrid seed again were higher than ever before, the grand total being 88,188 pockets of 100 lb. each. This included 14,000 pockets sent to Northern Rhodesia as compared with 10,000 the year before. It is difficult to ascertain the amount of seed sold to Africans, but it is thought that at least 5,000 pockets were purchased by them. About 140 pockets of single hybrid seed were sold last year.

The area sown to produce this crop was 4,700 acres so that the average yield delivered for sale was 19 pockets an acre. Total yields were, of course, higher than the above as a considerable quantity of seed was discarded in the way of diseased and off-type cobs and of small grains.

Single Hybrid Seed

Very favourable reports on the performance of single Hybrid No. 52 were received last year and some twenty members decided to give seed production of this kind a trial this season. About 230 acres were sown to this strain and approximately 2,500 pockets were produced. Of these, 2,000 were delivered to the agent for sale to commercial growers. Orders for single hybrid seed already placed with the agents were more than half the amount of seed which it is likely will be reaped from the 900 acres which will be planted in the 1962-63 season.

Export of Seed

An inquiry for a parcel of 15 tons was received but at the time of writing this report a definite contract had not been concluded.

Exhibits at the Royal Show

At the recent Show held in Salisbury there were 16 entries in the shelled-seed class. Six awards were made to exhibits which were of a high standard but the number of disqualifications for avoidable errors was appalling.

Grading

In general the grading of the seed showed an improvement on that of previous years. Now that suitable machines are available, grading for width and thickness presents no difficulty, but some members still do not exercise enough care to ensure that long kernels are not mixed with short ones. Commercial growers of maize are becoming more particular about the grading of seed, as they know that well-graded seed is essential for trouble-free planting and accurately spaced stands.

Interim Report for the 1961-62 Season

Owing to the increased demand for hybrid seed and the increasing number of hybrids now being grown, it became necessary to increase the number of inspectors to four. This season, for the first time, single hybrid seed was produced for next season's commercial crop.

Issues of seed were supplied by the Department of Research and Specialist Services to 89 members of the Rhodesia Seed Maize Association. These consist of 59 with sales quotas, 22 probationers, and 8 who are growing solely for their own use. In addition to these there are nine members who did not purchase seed. Hence the Association has a total of 98 members.

The total acreage grown by members with sales quotas was 4,625. This was 75 acres less than last year, but 400 acres more than the year before. The acreage allocated to the various hybrids was as follows: Single hybrid, 265 acres; double hybrids, No. 13, 3,433 acres; No. 11, 1,810 acres, and No. 10, 242 acres. Growing conditions were most favourable for good yields in the Salisbury area but drought conditions prevailed in varying degrees in other areas.

Seed Maize Prices

There was no change in price of certified double hybrid seed of large and medium flats but the price for large rounds was increased and is now the same as that for large and medium flats. The prices for uncertified and certified open-pollinated seed remain the same.

Hybrid Maize Farm

The sixth crop of hybrid and inbred maize seed was produced on Panmure Hybrid Maize Farm. This was the last crop to be produced on this farm as the production of single hybrid seed and the bulking up of inbred seed has been taken over by the Rhodesia Seed Maize Association. The financing of the crop will be undertaken by the Farmers' Co-op. Ltd., Salisbury. All seed which was held in reserve and which was produced in the 1961/62 season at Panmure was sold to the Farmers' Co-op. Ltd. for distribution to farmers who will grow the commercial crop in 1962-63. The Department of Research and Specialist Services is now responsible only for the breeding of seed and the bulking of sufficient inbred seed to make the various crosses required.

As in the past small acreages of wheat and barley of several different varieties were grown for the Government Wheat Breeder in order to bulk up supplies of pure-bred seed for distribution to farmers.

Burley tobacco experiments continued as in the past, but for the 1962-63 season experiments on Burley tobacco will be conducted at Henderson Research Station as it has been decided that Panmure will be closed at the end of October, 1962.

GROUNDNUT RESEARCH

The past year was one of steady progress for the groundnut crop. From a condition of short supply, production of groundnuts moved towards a condition of adequate supplies for local consumption with a lessened dependence on imports. Exports of high quality kernels suitable for the confectionery trade are increasing.

With lower prices ruling for maize, and tobacco production in the drier areas showing less profitability, an increasing interest in alternative cash crops is being taken by European farmers in both Rhodesias, and groundnuts is one of these crops.

Field Trials

The results from field trials carried out at various research stations and at a number of farms, the latter with the help and co-operation of the Department of Conservation and Extension, continued to show the advantages of Valencia and Natal Common strains in the greater part of Southern Rhodesia and the drier south-western areas of Southern Rhodesia. These early, non-dormant varieties have their disadvantages, but are undoubtedly the best yielding and best adapted types for most areas receiving less than 30 inches of rain annually.

Full-scale trials at Gatooma, Matopos and Tjolotjo, using a wide range of substrains, showed no clear-cut differences between strains. Commercial stocks of both Valencia and Natal Common are currently adequate for requirements. Environmental factors, both natural and man-made, are the decisive agencies in deciding yield and quality levels.

Plant Breeding

Search within the collection of Valencia and Natal Common strains for superior types was continued, but so far without much success. Valencia stocks seem well suited to many parts of Matabeleland and to the drier areas of Mashonaland but have certain undesirable characteristics, in particular loose attachment of their pods to the haulm. This renders them less suited to mechanized farming than the Natal Common strains. Neither of these varieties show any variation in susceptibility to the common leaf spot diseases due to *Cercospora* spp., to which both are very susceptible.

The Mani Pintor derivatives present a much more hopeful picture, and the good performance of Makulu Red has encouraged further studies, and a major break-through seems possible in synthesizing new varieties of intermediate maturity with desirable characteristics.

Three strains of brown self-seeded material have been isolated and will be grown in progeny rows in the 1962/63 season. They vary in kernel size from seed as large as Makulu Red to that of normal Natal Common. They all show seed dormancy, and tolerance in some measure to leaf spot diseases. In addition a pink-seeded form of Makulu Red has appeared in the latter, which if it comes true to type may prove much more valuable as an export nut than its parent as its colour is more favoured in the trade than the red form.

Mechanization

Work continued on the problems of the mechanization of the crop; land preparation, sowing, inter-cultivation and harvesting methods are all being studied and the ready co-operation of the farm machinery trade is greatly appreciated.

Extension Work and Propaganda

In co-operation with the Department of Conservation and Extension the Field Officer, Groundnut Research gave a number of talks and lectures to farmers' associations and I.C.A. groups in both Southern and Northern Rhodesia during the past year. In addition a paper was read at the Rhodesia National Farmers' Union 1962 Conference on "Alternative Crops". Numerous questions put by individual farmers on groundnut technology were answered during the year, and discussions were held with the farm machinery, crop-processing, seed merchanting and other trades interested in the development of the groundnut industry.

PUBLICATIONS

Articles were prepared for the *Rhodesian Farmer* and the *Rhodesia Agricultural Journal* which were either published or will be published in the coming year. The Department of Conservation and Extension was assisted in its production of circulars dealing with groundnuts, and reprints of the *Rhodesia Agricultural Journal* articles will be distributed as a special booklet to all its officers.

GENERAL CROPS

Wheat Production

There has still been no progress made in summer wheat, and winter wheat production is almost static but the Government Wheat Breeder has bred a number of new varieties which are capable of very high yields and there is no reason why this crop should not be grown with profitable results on a very much larger scale in the winter on the highveld.

Potato Production

The demand for seed produced by the Southern Rhodesia Seed Potato Association still continues to exceed the supply; certified seed produced by this Association is of excellent quality and is fully up to the standard of imported seed.

Kenaf and Other Fibre Crops

There has been a considerable revival of interest in the growing of fibre crops to supply this country's requirements of fibre. A Fibre Research Officer was appointed and a series of experiments embracing fertilizer, variety, spacing and date of planting trials has been planned for the coming season.

Castor Bean

As has been reported previously the small, but steady, demand for castor-bean seed, for the extraction of oil for medicinal and industrial purposes continued. Further experiments are being conducted at the Gatooma Research Station on variety, spacing and date of planting trials in an endeavour to supply farmers with more specific recommendations on castor bean production.

Acknowledgements

The Department is indebted to the Director of Meteorological Services for the information on seasonal conditions.

ANIMAL HUSBANDRY

The year under review was reasonably favourable for livestock production. The reduction in the prices of grain has encouraged producers to go in for other lines of farming, particularly the feeding of cattle.

THE BEEF INDUSTRY

Below are given figures for the cattle population in the Federation over the past five years.

EUROPEAN AND AFRICAN-OWNED CATTLE IN THE FEDERATION
(*in thousands*)

Year	*Federal State*		*Southern Rhodesia*		*Northern Rhodesia*		*Nyasaland*	
	European-owned	*African-owned*	*European-owned*	*African-owned*	*European-owned*	*African-owned*	*European-owned*	*African-owned*
1957	1,600	3,190	1,434	1,981	155	892	11	317
1958	1,687	3,320	1,506	2,074	167	917	14	329
1959	1,747	3,384	1,553	2,087	179	955	15	342
1960	1,776	3,310	1,552	1,964	197	1,006	17	340
1961	1,827	3,417	1,599	1,988	213	1,070	15	359

The cattle population is still increasing although the rate of increase has slowed down. This is possibly due to the fact that new entrants to the industry have not been as numerous as in the past. It can also be connected with the after-effects of the severe 1959-60 drought.

An examination of the national herd does not reveal any significant improvement in the reproduction rate. It appears that increases in the national herd can largely be ascribed to a lower mortality rate.

Supplies of Slaughter Stock

TOTAL FEDERAL SLAUGHTERINGS
(Excluding slaughterings in African Areas for subsistence requirements)

Year	*Federal State*	*Southern Rhodesia*	*Northern Rhodesia*	*Nyasaland*
1957	330,717	264,355	37,613	28,749
1958	351,545	282,030	40,366	29,149
1959	422,491	345,894	50,359	26,238
1960	445,801	357,395	58,961	28,445
1961	450,674	341,753	76,155	32,766

Numbers and grades of cattle slaughtered in the controlled areas of Southern Rhodesia, for the year ended 30th September 1962

A.—COMBINED TOTALS FOR COLD STORAGE COMMISSION, SOUTHERN RHODESIA

Grade	*Oxen*	*Cows and Heifers*	*Bulls*	*Total 1962*	*Per cent.*	*Total 1961*	*Per cent.*
Rhodesia's Best	9,590	737	—	10,327	4	5,551	2·5
Imperial	15,591	781½	—	16,372½	7	17,243	7·8
Standard A	62,468½	5,030	—	67,498½	28	56,409	25·4
G.A.Q.	53,594½	25,777½	—	79,372	32	78,682	25·5
F.A.Q.	24,482½	13,956½	—	38,439	16	35,625½	16·1
Compound	12,840½	9,600	2,347	24,787½	10	23,593½	10·6
Inferior	1,523	4,537½	102	6,162½	3	4,568	2·1
TOTAL	180,090	60,420	2,449	242,959		221,672	

B.—COMBINED TOTALS FOR PRIVATE BUTCHERS IN SOUTHERN RHODESIA

Grade	*Oxen*	*Cows and Heifers*	*Bulls*	*Total 1962*	*Per cent.*	*Total 1961*	*Per cent.*
Rhodesia's Best	198	56	—	254	1	548	1·6
Imperial	659½	201½	—	861	3	1,796	5·2
Standard A	2,821½	1,276	—	4,079½	13	4,295	12·3
G.A.Q.	3,705	5,602	—	9,307	30	9,999	28·7
F.A.Q.	2,441	4,168	—	6,609	21	6,583	18·9
Compound	1,959	4,880½	1,331	8,170½	26	9,238	26·5
Inferior	190	1,610	68	1,868	6	2,382	6·8
TOTAL	11,974	17,794	1,399	31,149		34,841	

TOTAL CATTLE SLAUGHTERED BY THE COLD STORAGE COMMISSION IN NORTHERN RHODESIA

Grade	*Oxen*	*Cows and Heifers*	*Bulls*	*Total 1962*	*Per cent.*	*Total 1961*	*Per cent.*
Rhodesia's Best	588	6	—	594	1·5	292	1·0
Imperial	2,650½	48	—	2,698½	6·8	741	2·7
Standard A	7,141	361	—	7,502	18·8	3,850½	13·9
G.A.Q.	5,644½	2,553	—	8,197½	20·5	4,735½	17·1
F.A.Q.	6,249½	1,956	—	8,205½	20·6	6,715½	24·3
Compound	6,891	1,588½	714	9,193½	23·0	7,766½	28·1
Inferior	2,321½	1,072½	117	3,511	8·8	3,562½	12·9
TOTAL	31,486	7,585	831	39,902		27,664	

TOTAL CATTLE SLAUGHTERED BY PRIVATE BUTCHERS IN NORTHERN RHODESIA

Grade	*Oxen*	*Cows and Heifers*	*Bulls*	*Total 1962*	*Per cent.*	*Total 1961*	*Per cent.*
Rhodesia's Best	40	8	—	48		215½	0·9
Imperial	744	101½	—	845½	5	1,213½	4·8
A. Grade	3,459	374	—	3,833	22	5,484	21·8
G.A.Q.	2,841	1,962½	—	4,803½	28	6,631	26·3
F.A.Q.	1,496	1,656	—	3,152	18	4,608	18·3
Compound	1,427	1,351½	340	3,118½	18	5,127	20·4
Inferior	536	949	23	1,508	9	1,890	7·5
TOTAL	10,543	6,402½	363	17,308½		25,169	

National statistics indicate an increase in cattle slaughtered during 1961. In the controlled centres the Cold Storage Commission increased killings by a very substantial number while private butchers' slaughterings were decreased considerably.

Careful observations are kept at all the controlled centres in order to establish whether any wasteful slaughterings occur. In addition to slaughterings already recorded, the following animals were slaughtered in these areas.

	Cold Storage Commission Total	*Private Butchers*
Calves	5,705	9,574
Heifers	9,279	2,786
Tollies	316	746
Immature Oxen	11,606	1,259

No alteration was made to the grading regulations during the year. Line-of-rail grading was discontinued in Northern Rhodesia on 1st August, 1962. During the period 1st October, 1961, until this date, 6,419 cattle were graded on the hoof for producers in Northern Rhodesia. Hoof grading is continuing at sales of African cattle.

Production and Marketing

The Ministry made a detailed examination of the production and marketing policy for beef cattle since pre-Turner Commission days. The report on this investigation confirmed certain fundamental concepts in the industry. Cattle breeding is a long-term enterprise and quick changes in production policy cannot be brought about in order to meet changed circumstances. Long-term stability is required in order to enable producers to plan production in advance. This guarantee has been provided in the form of the cattle prices agreement with the Rhodesian National Farmers' Union and it was envisaged that Government would carry out its obligations through the Cold Storage Commission. Two major concepts have always confused thinking on beef production policy. Authorities agree that increased production of beef can largely be brought about by increased calving rates, decreased mortality and slaughtering at a younger age. This inevitably results in the production of higher-quality beef. The drawback of cattle marketing in Rhodesia has been the pressure by distributors for low-quality meat in order to supply so-called "boys meat". The time is overdue for this term to disappear from the Rhodesian scene and for all consumers of meat to buy their requirements in properly designated cuts. Rhodesia is steadily developing a growing export trade in canned meat. It will be to the advantage of the whole industry if the poorer grades are made available to the canning factories.

A study of the grading returns indicates a steady decrease in the lower grades of beef and a substantial increase in the G.A.Q. grade as well as in the higher grades.

Immediately after the Turner Commission report in 1956, a new price schedule was drawn up. The main objectives were to increase production and spread supplies throughout the year because the country was short of beef in relation to demand. This price structure achieved its purpose in four to five years. Over the past two years the grade delivery pattern has changed to the extent that it is affecting the economic marketing of surplus beef. During this period, no major changes have been made in seasonal and grade price relationships.

During the present year a new price schedule was drawn up which has several new features. Considerable changes have been made in the seasonal prices of the Imperial and "A" grades. Weight differentials have been introduced on the higher grades which have the effect of paying at higher rates per 100 lb. cold-dressed weight for the heavier animals. In the middle grades steers will be paid for at more per 100 lb. c.d.w. than cows. Small increases were made in some lower grades to narrow the margin between these grades. This schedule will come into operation on 1st April, 1963.

It is anticipated that this price structure will encourage an even flow of good quality cattle throughout the year. Continuity of supply for both the local and export markets has always been emphasized as being of paramount importance to the successful marketing of the Federation's beef. The new prices will assist producers who are careful in the selection of their stock and who practise careful feeding and management systems, but it is unlikely to be as attractive to mediocre producers who do not pay proper attention either to their selection or to their feeding methods. It is also the intention to discourage the slaughter of light and unfinished animals which represents a waste to the industry, and creates problems in grading. The inclusion of light unfinished carcasses in export consignments has also been consistently criticized by our overseas agents, because they cause lack of uniformity and reduce the overall realization for the country's beef.

PIGS

NUMBER OF PIGS IN THE FEDERATION

(*thousands*)

Year	*Federal State*		*Southern Rhodesia*		*Northern Rhodesia*		*Nyasaland*	
	European-owned	*African-owned*	*European-owned*	*African-owned*	*European-owned*	*African-owned*	*European-owned*	*African-owned*
1957	80	188	59	57	18	44	3	87
1958	78	182	58	56	17	46	3	80
1959	79	214	61	47	15	50	3	117
1960	76	165	62	42	12	53	2	70
1961	84	204	70	42	12	63	2	99

PIGS SLAUGHTERED

Year	Federal State	Southern Rhodesia	Northern Rhodesia	Nyasaland
1957	115,500	94,332	15,040	6,128
1958	145,787	113,635	23,918	8,234
1959	157,221	123,280	25,359	8,582
1960	163,534	129,649	26,495	7,390
1961	153,074	118,395	26,738	7,941

PIGS SLAUGHTERED AND GRADED IN THE CONTROLLED AREAS OF THE FEDERATION

SOUTHERN RHODESIA

Class	*Colcom Products Central Co-operative Ltd.*		*Private Butchers*	
	1961	*1962*	*1961*	*1962*
Baconers	55,238	59,493	1,741	2,262
Porkers	25,866	30,073	9,944	8,237
Cutters	5,173	6,567	3,144	2,941
Under-weight	2,037	1,439	3,146	1,227
Over-weight	672	856	—	—
Sows	3,799	5,675	802	915
Boars	348	377	—	—
TOTAL	93,133	104,480	18,777	15,582

NORTHERN RHODESIA

Class	*Colcom Products Central Co-operative Ltd.*		*Private Butchers*	
	1961	*1962*	*1961*	*1962*
Baconers	5,265	4,057	334	201
Porkers	2,668	4,268	4,237	4,739
Cutters	417	587	565	638
Under-weight	69	142	—	307
Over-weight	79	142	—	—
Sows	263	651	—	499
Boars	18	53	—	
TOTAL	8,779	9,900	5,136	6,384

It is difficult to interpret the statistical information available on pigs. The pig population seems to be increasing but in 1961 pig slaughterings actually decreased. This position was reversed in 1962 with slaughterings by Colcom reaching a record number. Private butchers again killed fewer pigs than in the previous year. Several price changes were made during the year. The price changes were made, firstly, to discourage large-scale increases in pig production because of the lower grain prices and, secondly, to correct an imbalance between porker and baconer production. Export prices have been unfavourable and surplus pig products were exported mainly at a loss. Consumers are becoming more conscious of quality and demand pork and bacon with less fat and more lean. It is therefore essential to improve the quality of pigs in order to increase local consumption.

The grading system for pigs remained unchanged during the year. A more accurate system of grading porkers was introduced by splitting the fat down the centre of the back.

An interesting development during the year was the introduction of the Pietrain pig from Belgium into Rhodesia. These pigs have a very high percentage of lean meat in their carcass and, if successful in this country, they could make a substantial contribution to quality production.

Progeny Testing

The Pig Progeny Testing scheme has now been in operation for six years, and stud breeders are still strongly supporting the station. Unfortunately some breeders were prevented from participating in the scheme during the year, due to quarantine restrictions. The scheme will become more valuable to the industry as the numbers of breeding pigs tested increase. It is the only method to ensure that in the long term the pig industry of Rhodesia will be able to produce a uniformly high-quality product based on modern demand.

It is gratifying to report that the Livestock Improvement Committee has agreed to pay grants to breeders on boars that are sired by progeny-tested stock. These grants will be based on specific standards of performance. The following table gives a summary of the latest results:

PROGENY TESTING: AVERAGE RESULTS

	Large White	*Landrace*
Age in days at slaughter	184·7	177·5
Gain per day, lb.	1·51	1·48
Feed conversion	3·35	3·45
Length of carcass, mm.	812·7	855·7
Backfat—shoulder, mm.	43·7	38·2
midback, mm.	22·9	20·9
loin, mm.	28·4	24·4
Grading	A 82%	A 94%
	B 9%	B 3%
	C 9%	L 3%

SHEEP

NUMBER OF SHEEP IN THE FEDERATION
(thousands)

	Federal State		*Southern Rhodesia*		*Northern Rhodesia*		*Nyasaland*	
	European-owned	*African-owned*	*European-owned*	*African-owned*	*European-owned*	*African-owned*	*European-owned*	*African-owned*
1957	143	202	130	118	10	29	3	55
1958	159	228	146	144	11	24	2	60
1959	176	248	161	154	12	22	3	72
1960	204	220	188	131	13	23	3	66
1961	219	263	201	161	15	23	3	79

SHEEP SLAUGHTERED AND MARKETED
(European and African-owned)

	Federal State	*Southern Rhodesia*	*Northern Rhodesia*	*Nyasaland*
1957	47,881	41,701	4,102	2,678
1958	52,278	43,124	5,863	3,152
1959	51,103	40,124	8,548	2,431
1960	49,824	39,660	7,097	3,067
1961	50,502	44,279	3,031	3,192

Sheep numbers are expanding at an encouraging rate, but there is not a correspondingly high rate of increase in the number marketed. It can only be assumed that a larger number of sheep is being slaughtered for home consumption. The grading of sheep was extended to Fort Victoria, Bulawayo and Umtali.

SHEEP SLAUGHTERED AND GRADED IN THE CONTROLLED CENTRES OF SOUTHERN RHODESIA

COLD STORAGE COMMISSION

Grade	*Lamb*	*Per cent.*	*Grade*	*Mutton*	*Per cent.*
Super	412	9	1	1,548	33
Choice	1,588	35	2	702	16
Lamb	2,125	47	3A	947	21
4	386	9	3B	722	16
			4	517	12
TOTAL	4,511		TOTAL	4,436	

PRIVATE BUTCHERS

Grade	*Lamb*	*Per cent.*	*Grade*	*Mutton*	*Per cent.*
Super	113	3	1	3,225	35
Choice	547	15	2	2,059	23
Lamb	2,569	68	3A	2,439	27
			3B	1,042	11
TOTAL	3,762			9,128	

GENERAL

Close co-operation was maintained by the Branch with other departments on subjects of mutual interest. Numerous visits were made for specialist advisory purposes in spite of a serious staff shortage.

DAIRYING

DAIRYING SEASON

In general the season was satisfactory although rainfall was erratic, and rather prolonged periods of dry weather between rains affected forage crop production in some areas. The falling prices paid for milk due to increase in production without a corresponding increase in whole-milk sales has led farmers to make more use of home-grown feed to lower costs of production.

COMMISSION OF INQUIRY

The Commission of Inquiry into the Dairy Industry, appointed in September, 1961, and referred to in the previous year's report, submitted its report to the Governor at the end of November, 1961. This Report was presented to the Federal Assembly on the 31st January, 1962. No drastic reorganization of the industry was recommended although a number of recommendations were made for the improvement of marketing of dairy produce in Northern and Southern Rhodesia. The major recommendations have been considered by Government, the Rhodesian National Farmers' Union and the Dairy Marketing Board, and preliminary discussions have taken place but no major recommendation had been implemented before the end of the season under review.

DAIRY PRODUCE MARKETING AND LEVY ACT 1961

This Act was brought into operation on 18th May, 1962. The Dairy Marketing Board established under the Dairy Marketing Scheme originally introduced under the Agricultural Marketing Act, 1951, and preserved under the Agricultural Marketing Council Act, 1956, and operating only in Southern Rhodesia, was reconstituted under this Act which operates in Southern and Northern Rhodesia. Regulations under this Act were introduced in Southern Rhodesia on 18th May, 1962, and in Northern Rhodesia on 1st September, 1962.

THE DAIRY INDUSTRY

Production of Dairy Produce

Preliminary estimates indicate that total milk production in Southern Rhodesia increased by about 7.5 per cent. and in Northern Rhodesia by about 4.5 per cent. The Dairy Marketing Board in Southern Rhodesia received 928,000 gallons more milk than during the previous year, an increase of 6.5 per cent. In Northern Rhodesia, milk intake by the Co-operative Creameries showed an increase of 63,000 gallons, but this does not reflect a true position as a "separation on farm" scheme was operated during both years. It is estimated that production by producers supplying the Co-operative Creameries actually fell by 2.4 per cent. but this drop was compensated for by an increase in production by producer-retailers, particularly on the Copperbelt, and by supplies to the Zambesi Co-operative Dairies, resulting in an increase in the total production of the Territory as a whole. Towards the end of the season milk production in Southern Rhodesia appeared to be increasing at a greater rate than in the earlier part of the year, which may well indicate that the upward trend which decreased during the previous year will continue in spite of falling prices. Whole-milk sales by the Dairy Marketing Board in Southern Rhodesia fell slightly while whole-milk sales by the Co-operative Creameries in Northern Rhodesia increased by about 100,000 gallons. There is an encouraging though small increase in the sales of whole-milk in urban African areas, but under present conditions no dramatic increase in total whole-milk sales can be anticipated. This means that the increasing production is utilized for industrial purposes resulting in a falling price per gallon to producers. The marketing organizations are endeavouring to maintain the maximum price possible for this surplus milk but are of course facing the problem of continually rising costs. An increasing quantity of milk is used for skim-milk sales, particularly sour skim-milk to Africans, and these increased rapidly in Southern Rhodesia during the last year; 118,000 gallons were sold in September, 1962, as compared with 87,000 gallons for the same month a year earlier. It is anticipated that sales of these commodities could be increased appreciably in Northern Rhodesia during the coming year. Unfortunately, these increasing sales of skim-milk and the production of skim-milk powder result in an increasing butter production, which can create a problem, as consumption is remaining static or falling slightly. The Nestlé factory in Salisbury absorbed an increasing quantity of milk and this fact, plus the requirements for liquid skim-milk and skim-milk powder, resulted in cheese production being curtailed. Cheese production was insufficient to meet local demand and cheddar cheese was imported to meet the deficiency.

Although butter production continued to increase and Southern Rhodesia is nearing self sufficiency in this commodity, an appreciable quantity of butter had to be imported, mainly for the Northern Rhodesia market.

Production figures for the main commodities are given in Tables I and II for Southern and Northern Rhodesia respectively. These figures do not include butter and cheese produced by farmers, which were relatively small and would not alter the general picture.

Factories operating outside the orbit of the Dairy Marketing Board in Southern Rhodesia were the Gazaland Co-operative Cheese Factory at Chipinga and the Emco Creamery in Umtali. In Northern Rhodesia the only factory not operated by the Co-operative Creameries was the Zambesi Co-operative Dairies at Livingstone, where consumption of whole-milk increased after the installation of pasteurizing plant.

TABLE I

DAIRY PRODUCTION 1920–1962: SOUTHERN RHODESIA

Year	*Butter (1,000 lb.)*	*Cheese (1,000 lb.)*	**Milk Used for Dried Milk (1,000 gal.)*	*†Liquid Milk (1,000 gal.)*	*Total (1,000 gal.)*
1920 . . .	600	79	—	258	2,000
1930 . . .	1,768	163	—	1,008	6,100
1940 . . .	1,686	383	—	2,095	6,910
1950 . . .	900	394	—	5,720	9,000
1955/56 . .	1,083	2,168	—	8,050	13,202
1960/61 . .	2,899	1,704	2,974	8,853	18,800
‡1961/62 . .	3,074	1,845	3,859	9,190	20,200

* Milk used for skim-milk powder production which started in 1957 and whole-milk powder production which started in 1960.
† Milk available for liquid milk, fresh cream and ice-cream.
‡ Preliminary figures.

TABLE II

DAIRY PRODUCTION 1956–1962: NORTHERN RHODESIA

Year	*Butter (1,000 lb.)*	*Cheese (1,000 lb.)*	**Liquid Milk (1,000 gals.)*	*Total (1,000 gals.)*
1956/57	40	497	1,750	2,400
1959/60	231	745	2,600	4,000
1960/61	316	496	3,040	4,400
†1961/62	249	369	3,600	4,600

* Milk available for liquid milk, fresh cream and ice-cream.
† Preliminary figures.

The number of suppliers and the total milk intake of the Dairy Marketing Board and the Co-operative Creameries of Northern Rhodesia are shown in Tables III and IV respectively. It is apparent that the trend of increasing milk production per farm continues.

TABLE III

DAIRY MARKETING BOARD: SOUTHERN RHODESIA

Year	*Number of Suppliers (August)*	*Total Milk Supplied*
1955/56	403	8,852,000
1959/60	531	13,815,000
1960/61	525	14,307,000
1961/62	527	15,236,000

TABLE IV

THE CO-OPERATIVE CREAMERIES OF NORTHERN RHODESIA

Year	*Number of Suppliers (August)*	*Total Milk Supplied*
1955/56	118	1,431,000
1959/60	137	3,076,000
1960/61	128	*3,031,000
1961/62	116	*2,957,000

* These figures include butter-fat supplied under the "Separation on Farm" scheme converted back to estimated gallons of milk.

Creameries, Butter Production and Consumption

Three creameries operated in Southern Rhodesia, at Gwelo, Salisbury and Umtali, but butter production at Salisbury was discontinued, the cream being transferred to Gwelo for manufacture. This arrangement did not work very satisfactorily and it has been decided to recommence butter manufacture in Salisbury as soon as the necessary facilities can be provided at the new dairy, which is expected to be at the end of 1962. The only creamery operating in Northern Rhodesia was at Lusaka. The Zambesi Co-operative Dairies Ltd., produced a very small amount of butter from surplus milk and a small quantity of butter is produced on farms in the remoter areas. Butter production increased in Southern Rhodesia due to increasing sales of skim-milk. Butter production decreased in Northern Rhodesia due to the ending of the "Separation on Farm" scheme in February, 1962. Production was not sufficient to meet the demand and 1,124,723 lb. of butter was imported from Kenya, South Africa and Australia in the following proportions: Kenya, 12.5 per cent.; South Africa, 67.5 per cent.: Australia, 20.0 per cent.

A small quantity of butter was exported to Portuguese East Africa and most of Nyasaland's requirements were supplied by Southern Rhodesia and are included in the consumption figures for that Territory.

The production and apparent consumption of creamery butter for Southern Rhodesia and Northern Rhodesia, showing the trends over the past few years, are given in Tables V and VI:

TABLE V

PRODUCTION AND APPARENT CONSUMPTION OF BUTTER

SOUTHERN RHODESIA

Year	*Production (1,000 lb.)*	*Apparent Consumption (1,000 lb.)*	*Shortfall Met by Importation (1,000 lb.)*
1950/51	767	2,643	1,876
1956/57	1,398	3,997	2,599
1960/61	2,899	3,265	366
1961/62	3,074	3,200	126

TABLE VI

PRODUCTION AND APPARENT CONSUMPTION OF BUTTER

NORTHERN RHODESIA

Year	*Production (1,000 lb.)*	*Apparent Consumption (1,000 lb.)*	*Shortfall Met by Importation (1,000 lb.)*
1956/57	44	1,678	1,634
1960/61	316	1,281	965
1961/62	249	1,280	1,031

Butter-fat prices to producers remained unchanged as follows:

	Minimum Prices (per lb.)	
	1st Grade	*2nd Grade*
	s. d.	s. d.
January to March	3 6	3 3
April and December	3 10	3 7
May to November	4 2	3 11

Maximum retail prices for butter also remained unchanged at 4s. 1d. per lb. for 1st grade and 3s. 11d. per lb. for 2nd grade butter in 1-lb. pats. The maximum price for butter in ½-lb. pats was slightly higher at 2s. 1d. per ½ lb. for 1st grade and 2s. per ½lb. for 2nd grade. There was no price control for other grades of butter-fat or butter.

It should be noted that due to retail price wars, butter could be purchased in most centres at well below the maximum prices quoted above, many shops selling at the wholesale price and some shops even selling at below the wholesale price. This may have had the effect of maintaining sales of butter at a level higher than would have obtained had the maximum prices been charged.

Tables VII and VIII give the grades of butter manufactured as a percentage of total production for Southern and Northern Rhodesia respectively. All butter must be graded before sale in Southern Rhodesia but no such obligation by law exists in Northern Rhodesia, although Dairy Officers carried out check grading in that Territory from time to time for advisory purposes. The requirements of a local manufacturer of margarine containing 10 per cent. butter were supplied by the Gwelo Creamery.

TABLE VII

BUTTER GRADES AS PERCENTAGE OF TOTAL MANUFACTURE

SOUTHERN RHODESIA

Year	*First Grade (Per cent.)*	*Second Grade (Per cent.)*	*Third Grade (Per cent.)*
1959/60	92·0	6·0	2·0
1960/61	93·0	5·0	2·0
1961/62	90·0	8·0	2·0

TABLE VIII

BUTTER GRADES AS PERCENTAGE OF TOTAL MANUFACTURE

NORTHERN RHODESIA

Year	*First Grade (Per cent.)*	*Second Grade (Per cent.)*	*Third Grade (Per cent.)*
1959/60	84·0	—	16·0
1960/61	93·0	—	7·0
1961/62	100·0	—	—

CHEESE FACTORIES: CHEESE PRODUCTION AND CHEESE CONSUMPTION

Six factories manufacture cheese in Southern Rhodesia at Bulawayo, Gwelo, Gatooma, Salisbury, Umtali and Chipinga. Production at Gwelo was very small as nearly all surplus milk delivered to that dairy was manufactured into skim-milk powder. In Salisbury cheese was produced only during a period of about six weeks at the height of the flush season. The main manufacturer of cheese was the Bulawayo Dairy where a very good quality of cheddar cheese was produced. This factory manufactured 63.4 per cent. of the cheese made, and 99.9 per cent. of this was of first-grade quality. The factory at Umtali produced mainly Gouda cheese for most of the year and the Gazaland Co-operative Cheese Factory, at Chipinga, produced only cheddar cheese, except for a very small quantity of Gouda required for local sales.

Both cheddar and Gouda cheese was manufactured at Mazabuka in Northern Rhodesia but its production did not meet local requirements and cheddar cheese was imported from South Africa, whilst some Gouda cheese was supplied from Southern Rhodesia.

The production of Roquefort cheese at Gatooma continued to increase and a good quality product was made. It appears that this cheese is finding a ready market and is displacing the imported article.

All cheddar cheese is graded before sale in Southern Rhodesia and Table IX shows the percentage of each grade of cheddar cheese manufactured during recent years. There is no statutory requirement for grading of cheddar cheese in Northern Rhodesia but Dairy Officers have examined the cheese produced for advisory purposes to try to improve the quality.

TABLE IX

CHEDDAR CHEESE GRADING AS PERCENTAGE OF TOTAL CHEESE GRADED IN SOUTHERN RHODESIA

Year	*First Grade*	*Second Grade*	*Third and Below Grade*
1957/58	97·3	2·4	0·3
1958/59	93·6	6·1	0·3
1959/60	96·1	3·6	0·3
1960/61	93·5	5·8	0·7
1961/62	97·0	2·8	0·2

The quantity of farmhouse cheese produced was small and the varieties were mainly confined to soft cheeses, such as cream and cottage types. Only one farmer manufactured cheddar cheese. This farmer and the Gazaland Co-operative Cheese Factory, at Chipinga, were paid a special subsidy of 6d. per lb. on cheese produced, and this subsidy amounted to over £5,000 for the year under review.

The wholesale and maximum retail prices of cheddar and Gouda cheese remained unchanged throughout the year. Maximum retail prices were 3s. per lb. for first grade cheddar and Gouda in Southern Rhodesia and 3s. 6d. per lb. for cheddar in Northern Rhodesia. Second grade cheddar sold at 2d. per lb. less than first grade in Southern Rhodesia and Gouda cheese sold at 3d. per lb. more than cheddar in Northern Rhodesia.

Milk Supplies and Milk Prices

As mentioned previously in this report, the milk intake by the Dairy Marketing Board increased by 928,000 gallons and indications are that the rate of expansion is increasing. If the "separation on farm" scheme is not reintroduced in Northern Rhodesia during the coming year, it is likely that there will be a small increase in intake by the Northern Rhodesia dairies. Tables X, XI and XII show the milk intake of the Dairy Marketing Board, the Co-operative Creameries and the Zambesi Co-operative Dairies respectively in recent years, together with the apparent consumption of whole-milk and milk surplus to whole-milk requirements.

Producer prices for milk supplied to the Dairy Marketing Board and Co-operative Creameries were calculated on the same basis as for previous years, in accordance with the milk price agreement between the Government and the Farmers' Union. This agreement does not apply to milk supplied to Zambesi Co-operative Dairies. It will be seen from Table X that due to increased production the quantity of surplus milk increased appreciably in Southern Rhodesia.

TABLE X

DAIRY MARKETING BOARD: SOUTHERN RHODESIA

Year	*Total Milk Intake (1,000 gals.)*	*Apparent Consumption Whole-milk (1,000 gals.)*	*Surplus over Whole-milk Requirements (1,000 gals.)*
1957/58	10,794	7,158	3,636
1958/59	12,379	7,348	5,031
1959/60	13,815	7,178	6,637
1960/61	14,307	7,162	7,145
1961/62	15,236	7,154	8,082

TABLE XI

CO-OPERATIVE CREAMERIES OF NORTHERN RHODESIA

Year	*Total Milk Intake (1,000 gals.)*	*Apparent Consumption as Whole-milk (1,000 gals.)*	*Surplus over Whole-milk Requirements (1,000 gals.)*
1957/58	2,211	1,635	576
1958/59	2,867	1,656	1,211
1959/60	3,076	1,711	1,365
1960/61	2,766	1,688	1,078
1961/62	2,829	1,800	1,029

Note.—The "Separation on Farm" scheme operated during 1960/61 and 1961/62. It is estimated that this reduced actual milk intake by 265,000 gallons in 1960/61 and by 128,000 gallons in 1961/62.

TABLE XII

ZAMBESI CO-OPERATIVE DAIRIES

Year	*Total Milk Intake (1,000 gals.)*	*Apparent Consumption as Whole-milk (1,000 gals.)*	*Surplus over Whole-milk Requirements (1,000 gals.)*
1958/59	163	137	26
1959/60	183	143	40
1960/61	193	140	53
1961/62	199	162	37

Tables XIII and XIV show the actual prices paid for milk supplied to the Dairy Marketing Board and the Co-operative Creameries, Northern Rhodesia, during the last two years. It should be noted that the milk separated by producers in Northern Rhodesia under the "Separation on Farm" scheme gave producers the appropriate butter-fat value plus the residual value of the skim-milk left on the farm and this is not reflected in the prices quoted in Table XIV.

TABLE XIII

DAIRY MARKETING BOARD: SOUTHERN RHODESIA

Month	*Standard Price per gallon*	*Actual Average Pay-out Without Quality Bonus*	
	1961/62	**1961/62*	*†1960/61*
	d.	d.	d.
October	51	37·6	38·9
November . . .	51	36·25	37·6
December . . .	37	26·5	27·6
January	37	27·0	27·5
February	37	28·0	29·0
March	47	34·1	35·4
April	47	33·7	35·6
May	47	34·5	35·6
June	47	35·0	36·8
July	51	36·6	39·3
August	51	35·6	38·5
September . . .	51	36·3	37·5

* Prices subject to adjustment when actual average realization value of surplus milk is determined by the Dairy Marketing Board. This adjustment is likely to be an increase of about ½d. per gallon on the prices quoted for 1961/62.

† Prices to June include supplementary payment on surplus milk.

TABLE XIV

CO-OPERATIVE CREAMERIES: NORTHERN RHODESIA

Month	*Standard Price per gallon*	*Actual Average Pay-out Without Quality Bonus per gallons*	
	1961/62	*1961/62*	*1960/61*
	d.	d.	d.
October	51	45·0	40·5
November . . .	51	39·75	39·8
December . . .	37	26·6	29·0
January	37	27·2	29·1
February	37	29·1	31·75
March	47	37·42	38·0
April	47	37·65	39·0
May	47	38·66	39·0
June	47	38·5	40·43
July	51	41·6	44·0
August	51	40·75	44·5
September . . .	51	42·25	44·75

Retail prices for milk remained unchanged at 8d. per pint for the prescribed areas of Southern Rhodesia, 8½d. per pint in the Midlands of Northern Rhodesia and 9½d. per pint on the Copperbelt. Retail milk prices in the main towns of Southern Rhodesia are controlled by means of a milk prices order, but there is no such legal control in Northern Rhodesia and prices there are agreed with Government where subsidies are involved.

There is no control of prices in Livingstone, where at the beginning of the season retail prices were 7d. per pint for coupon sales and 7½d. per pint for cash, collected. An additional ½d. per pint was charged for delivery. From the 1st

February, 1962, these prices were increased to a flat rate of 8d. per pint and this price was further increased to 8½d. per pint from the 1st June, 1962. These price increases were made after the installation of pasteurizing plant in January and modern bottle-washing and filling machines in June. In spite of the price increases, milk sales in Livingstone increased as shown in Table XII. This was undoubtedly due to the improved quality of the milk being sold after the installation of proper equipment at the dairy.

Producers supplying Zambesi Co-operative Dairies operated under a quota system and they were paid 3s. 6d. per gallon for quota milk and 2s. per gallon for surplus milk, except in September when producers received 3s. 3d. per gallon for all milk delivered to the dairy. In addition to this price, most producers who supplied this dairy qualified for a bonus of 4d. per gallon on all milk sold under the Dairy Production Assistance Scheme.

As there is no statutory control of milk prices in Northern Rhodesia, producer-retailers selling milk in opposition to the Co-operative Creameries were not subject to price control, and although accurate information is not available it is understood that milk was sold by producer-retailers at prices varying between 7½d. and 9d. per pint in the Midlands and between 8d. and 10d. per pint on the Copperbelt.

Producer-retailers selling milk within the price control areas in Southern Rhodesia are required to pay a levy of 8d. per gallon on milk sold within these areas. This levy is collected by the Dairy Marketing Board and used to off-set subsidy requirements. No levy is payable in Northern Rhodesia at present, but the Commission of Inquiry recommended that such a levy should be introduced, and it is expected that this will be done in the near future. The Commission also recommended that a similar levy should be imposed on fresh cream sales within these areas.

Fresh Cream

Fresh cream was sold by main dairies and by a number of producer-retailers. No reliable estimate of consumption can be made but it is thought that the demand was adequately met.

Dried Milk

The Dairy Marketing Board continued to manufacture both roller and spray-dried skim-milk at its Gwelo factory. Consumption of this commodity has increased dramatically and local production, which is limited by the size of the plant installed, was inadequate to meet the demand in spite of diversions of milk from cheese to skim-milk powder manufacture. The spray-dried powder was sold in ½-lb. and 1-lb. packets to retailers by the Board and in bulk to other packaging firms. The roller-dried powder was mainly used for stock feed by stock feed manufacturers. The Nestlé factory in Salisbury produced dried whole-milk and sales of the locally produced commodity are gradually displacing imports although it was claimed that the import duty was inadequate and a case was put up to have this increased. This factory also produces proprietary baby food.

Sterilized Milk

Sterilized milk was produced by the Co-operative Creameries at Lusaka and by the Dairy Marketing Board at Bulawayo. Sales of this commodity continue to increase, largely due to an extended area of distribution, particularly into Nyasaland. However, total sales, when viewed in perspective, are relatively small and do not dispose of very large quantities of milk. It is probable that when the Dairy Marketing Board has finally completed the take-over of the Co-operative Creameries in Northern Rhodesia, production of sterilized milk will be concentrated in one factory in order to achieve economies by increasing through-put.

Ice-cream and Other Frozen Products

There are two main producers of these commodities in Southern Rhodesia, namely the Dairy Marketing Board and Lyons. Ice-cream is also produced by the Emco Creamery in Umtali and by some small factories in other centres. In Northern Rhodesia the only substantial manufacturer of these commodities was the Co-operative Creameries. Competition in selling these commodities is very keen but total sales are increasing and it is anticipated that further large increases in sales will be attained. The Dairy Marketing Board installed a Vitaline machine in May, 1962, and since then its sales of ice-cream and other frozen products have increased substantially. These products are now sold all over Southern Rhodesia and in the main areas of Northern Rhodesia. It is understood that Lyons are contemplating extending their factory in the near future.

Dairy Bonus Scheme

This scheme, introduced in 1954, has continued to operate but the Commission of Inquiry recommended that it should be brought to an end. It operates only in Southern Rhodesia and relatively few producers participate. Payments of bonus for the 1961/62 year are likely to be similar to those for the previous year, which were less than anticipated at £8,190 on butter-fat and £2,438 on cheese milk. Consideration is being given by Government to the termination of this scheme, but it is likely to continue for at least another two years as it cannot be terminated without one year's notice.

Milk Recording

The proposed changes to the scheme which have been mentioned in previous reports were introduced in April, 1962, when a new set of rules was brought into force. The main changes are concerned with the substitution of master pages which can be photo-copied, in place of the lactation sheets previously used. Also a system of identification of cows based on numbers which can be tattooed in the ears of the animals has been introduced. In general, farmers have welcomed these changes although certain difficulties have been met in some cases. It will of course take about a year to substitute the new system for the old. During the year lactation summaries for all cows recorded between 1955 and 1962 were coded and punched on Hollerith cards. Lactation details for the year 1959/60 were also punched on to these cards and it is hoped that this information will be analysed to be used for the benefit of the industry within the next few months. It is intended to keep future records in this manner so that mechanical analysis can be done from time to time.

Some work was also done on analysis of records of the progeny of bulls used under the A.1. scheme but the value of these results has not yet been determined as it is not known whether formulae applied in other countries can be applied here. This is being investigated further.

Tables XV and XVI give the production figures for the winners of the milking competitions and average production per cow recorded respectively in recent years:

TABLE XV

PRODUCTION OF WINNING HERDS IN MILKING COMPETITIONS
(Average of the best 15 cows in the herd)

Year	*Milk Section* (*lb.*)	*Butter-fat Section* (*lb.*)
1956/57 . . .	14,908	511·9
1957/58 . . .	14,863	503·6
1958/59 . . .	17,153	592·3
1959/60 . . .	17,497	601·2
1960/61 . . .	16,272	593·3

TABLE XVI

AVERAGE PRODUCTION PER COW
(Pedigree and Grade Herds)

Year	*Number of Completed Lactations*	*Average Milk Production per Cow* (*lb.*)	*Average Butter-fat Production per Cow* (*lb.*)	*Average Butter-fat Percentage*	*Days*
1956/57 . . .	9,050	6,683	257·7	3·86	286
1957/58 . . .	9,783	6,674	260·5	3·79	277
1958/59 . . .	11,432	6,674	270·7	4·06	277
1959/60 . . .	12,330	6,643	267·0	4·02	276
1960/61 . . .	11,825	6,746	270·6	4·01	275

GENERAL

Negotiations for the take-over of the Co-operative Creameries of Northern Rhodesia by the Dairy Marketing Board were completed and the Board took over the management of the Creameries on 1st July, 1962, on a caretaker basis until financial accounts were completed. It is anticipated that the final take-over will be completed at the end of October, 1962.

On 1st September, 1962, the Dairy Marketing Board took over the butter-making activities of Emco Creamery in Umtali and continued to operate the creamery in the same premises, which were leased from Messrs. Hodgson & Myburgh. It is anticipated that this arrangement will continue until early 1963 when the necessary facilities will be provided at the Umtali Dairy and the plant purchased from Messrs. Hodgson & Myburgh will be installed in this dairy.

Extensions to the new Salisbury dairy were completed and all the activities of the Board in Salisbury are now centred on this dairy. Cream from producers has been received at the dairy on a temporary basis and then transferred to

Gwelo for manufacture into butter. It has now been decided to recommence butter manufacture in Salisbury and the necessary facilities are being provided. It appears, also, that some extension to cold-room facilities will have to be provided at this dairy in order to cope with the rapidly increasing production of ice-cream and other frozen confections. This factory now produces all the Board's small packs for the whole of Southern and Northern Rhodesia and only bulk ice-cream is made at other dairies.

THE DAIRY BRANCH

Officers of the Branch continued to perform all the milk testing required for the purpose of the payment on quality scheme which has been in operation since 1949. During the year about 16,000 samples of milk were tested for the purpose of this scheme at the five dairies in Southern Rhodesia and four dairies in Northern Rhodesia. In addition a large number of advisory tests were carried out in order to help farmers to overcome production problems. Milk tests were also carried out on milk supplied by producers to the Zambesi Co-operative Dairies in Livingstone, although these are not included in the payment on quality scheme.

Dairy officers also carried out their statutory duties of inspection of dairy premises, both on farms and in factories; graded dairy produce; judged at agricultural shows and lectured at the Gwebi Agricultural College. Very little time is available for investigational work and the writing of advisory articles but the bulletin on the Boltt Dairy Boiler was revised, the dairy officer in charge of milk records supplied some articles for the *Rhodesian Farmer* on changes in the milk recording scheme and other related subjects, and a certain amount of investigational work was done on circulation-cleaning of milking machines, on which a paper was prepared for publication in the *Rhodesia Agricultural Journal*. Dairy officers also carried out milk tests on individual cows at Grasslands Research Station in connexion with an experiment on feeding being carried out there.

The Chief Dairy Officer, who was appointed Secretary to the Commission of Inquiry into the dairy industry, continued in that capacity until the end of November, 1961. All meetings of the Dairy Marketing Board and most subcommittee meetings of that body were attended by the Chief Dairy Officer or his deputy, and numerous departmental and farmers' meetings were attended by officers of the Branch.

The Dairy Produce Marketing and Levy Act provides for inspectors to be appointed for the purpose of the Act. The inspection work is mainly concerned with inspection of records kept by producer-retailers and the levy paid by them. All dairy officers have been appointed inspectors for this purpose but this is considered to be an unsatisfactory position as such work is not consistent with the advisory nature of most of the work done by dairy officers. It is hoped that some other arrangements can be made for dairy officers to be relieved of these duties, as in addition to the undesirability of this arrangement this work takes up considerable time and must lead to other duties being neglected.

The distribution of staff at the end of the year was as follows: two dairy officers and one milk recorder in Northern Rhodesia stationed at Lusaka; one dairy officer and one milk recorder at Gwelo; two milk recorders at Bulawayo; one milk recorder at Umtali and the remainder of the staff at Salisbury.

The following posts were upgraded during the year: Senior Dairy Officer (Salisbury) from Senior Professional Officer II plus I to Senior Professional Officer I; Senior Dairy Officer (Lusaka) from Senior Professional Officer II to Senior Professional Officer II plus I, and two Professional Officer posts to Senior Professional Officer II. These last two posts provided for a redistribution of the work by the appointment of a Regional Dairy Officer for Mashonaland and Manicaland stationed at Salisbury, and a Regional Dairy Officer for Matabeleland stationed at Gwelo. There was no increase in establishment during the year but four supernumerary posts were created for nine months, to undertake the coding and punching of milk records so that they can be analysed mechanically.

Increasing demands have been made on staff and it has only been possible to carry out the most essential work by loyal and willing co-operation and working long hours on many occasions. This devotion to duty by all staff is deeply appreciated.

POULTRY

INTRODUCTION

Seasonal conditions are not of great importance to the poultry farmer, his main concern being availability and price of feeds and remunerative markets for his produce. The past year therefore can be said to be marked mainly by a slight increase in feed cost and a somewhat overproduced poultry market with a consequent drop in prices.

Increased efficiency in production has been necessary, and in most cases poultry farmers with improved stock available have responded well to the challenge. A few have failed in their enterprise, and many are experiencing much lowered returns.

A Poultry Industry Advisory Committee to the Ministry was appointed on January 27th, 1962. The chairman is the Under-Secretary for Economics and Marketing, with the following representatives: The Chief Poultry Officer, Ministry of Agriculture; Rhodesia National Farmers' Union (one representative for egg producers, one for broiler producers and one from Northern Rhodesia); the Rhodesian Poultry Breeders' Association, the Salisbury Poultry Club and the Bulawayo and District Poultry Association, one representative each; total eight.

The first meeting was held on 15th February, the second on 10th May and the third on the 18th October. In addition, a sub-committee appointed to advise on urgent import requirements met on the 24th March.

Apart from consideration of requests for imports, a wide variety of matters in connexion with the industry have been discussed. Qualifications for breeders who wish to import have been drawn up and a register of these breeders has been established.

It is felt that for the producers and the Ministry, the committee performs a useful service, but a fuller committee embracing trade and commerce might be of greater value.

The survey into the economics of egg and poultry production by the Economics and Marketing Branch of the Ministry is proceeding, but a less detailed survey that can produce a report in a shorter period has been agreed upon.

The Central African Statistical Office attempted a comprehensive census of poultry flocks in April but the response from farmers, at only 50 per cent. of returns, invalidated results. A further effort to obtain more detailed statistics has been postponed.

EGG PRODUCTION

Egg production and consumption has increased in Southern Rhodesia. The producer price fluctuates somewhat from place to plave but on average was approximately the same as last year at 3s. 4d. per standard dozen.

Larger quantities of egg pulp were manufactured this year, following a shortage which necessitated some importation last year.

In Northern Rhodesia egg consumption declined somewhat, though producer prices remained on average the same as the previous year at 3s. 10d. to 4s. per standard dozen. There was some movement of eggs from Southern Rhodesia to the Copperbelt.

The tendency for egg producers to become fewer in number, but with larger flocks, continued, and emphasized this change which follows naturally when profit margins become narrower.

In the Bulawayo area a producers' egg marketing company has been established on the same lines as that reported operating in Mashonaland last year. Both are proving successful and are providing a quality product for the consumer in graded, packaged form from the farm, suited to modern supermarket trade.

The egg production and value in Southern Rhodesia has increased by 50 per cent. between 1955 and 1961. In Northern Rhodesia the egg production and value have decreased slightly during the same period.

TABLE POULTRY

The production of table poultry, particularly in the broiler trade, increased considerably in both Rhodesias during the year and until Christmas consumption kept pace with production

The production and value of table poultry in Southern Rhodesia has increased nearly 200 per cent. between 1955 and 1961 and in Northern Rhodesia has doubled during the same period.

The slack period following Christmas and the general weakening of business caused a considerable surplus of table poultry to develop in storage. Prices have been lowered, and with increased export sales the position has improved so that consumption is rising, but as yet it has not overtaken the quantity in storage.

Prices to producers dropped from 3s. 6d. per lb. in some cases to 2s. 9d. per lb. for broiler stock and from 2s. 6d. to 1s. 10d. per lb. for roasters. These prices are barely remunerative to efficient producers.

A private producer-owned company, The Rhodesia Chicken Company (Pvt.) Ltd., is processing broilers for marketing in Salisbury and for export. Production is expected to rise to 10,000 birds per week by the end of the year. With probable reduced costs of production and processing, the future prospects for this business are bright, but everything depends on a lower price for maize.

Turkeys

The production of turkeys increased and as anticipated last year no imports were required for the Christmas market. The requirements of the Federation should from now on be amply met by local production. Sales of turkeys throughout the year are also increasing. There is room for improved quality but with internal competition for sales, quality is also improving. As with broilers cheaper maize will induce both larger production and lead to improved quality.

Ducks

Duck production declined slightly, probably due to economic conditions favouring cheaper meats.

Geese

Geese increased in numbers but are not produced commercially to any extent.

STOCK AND MANAGEMENT

The production of first quality broilers in quantity is changing the pattern of production, the management practices and the type of stock for egg as well as table-bird producers. Broiler stocks, the very best available in the United Kingdom and United States of America, have been imported during the last few years by progressive breeders with the result that Rhodesia today has the best broiler stock available in Africa. With the high cost of the main feed ingredient, maize, this improved stock was essential to obtain a profitable food conversion rate.

The internal and export sales of this improved stock now available are a complete justification for its introduction and will undoubtedly put Rhodesian poultry breeding in a very favourable position in Africa in future.

The sales of broilers naturally affected the traditional sales of cull layer hens and these are now available to lower income groups at lower prices more in keeping with their value, at the same time making available protein food more available and increasing poultry sales generally.

The figures in the tables following amply bear out these statements but are incomplete as the overall numbers and sales are higher than those obtained by the Statistical Office owing to backyard and smallholding production, which is not included.

Egg producing stock of the highest quality has also been imported more recently, and in this important section of the poultry business reduced costs of production are following because of higher production at less feed cost. This means that in spite of the greatly increased costs of feeding, eggs and poultry remained at the same average prices or even lower during the last year.

Improved management has played and is playing a big role in lowering costs also. The battery system and group cage production is gaining in popularity as the efficiency of this system and lowered capital cost of equipment become more generally appreciated by producers. The use of artificial light has proved valuable in improving winter production, and although a definite pattern for local conditions is not yet available, increased light in winter is certainly necessary. Research in this respect will be commenced at once.

Low cost, improved housing for layers kept on deep litter has also been effective in improved health, lower mortality and therefore increased hen-housed production. This type of housing with greatly increased ventilation has followed directly on trial housing erected first at Gwebi Colleg in 1957. Many commercial egg producers now provide housing of this type.

Feeding plays a very big part in poultry management. In this respect there has been very little change during the last few years because for a long time the best use has been made of the ingredients available. Some improvement in vitamin and mineral supplementation and in the use of antibiotics has been responsible for better nutrition, but until a better vegetable protein than groundnut cake, such as soya-bean or safflower cake, is available, little improvement in nutrition is likely.

Increased energy values in broiler and laying rations have improved conversion rates, but as fats available are high priced in the Federation they have not been used and there is a limit to the use of maize. Some cassava has been used for this purpose and can be incorporated up to 7½ per cent. with advantage. It would appear, therefore, that with the best quality stock now available, the experience gained by efficient producers and the improved housing, the main production problem is the price of maize and improvements which may be made in nutrition. Subject to favourable developments in these respects, both egg production and table-bird production should advance spectacularly and provide valuable protein feeds at the lowest cost, in the best form and in the quickest time for the lower income groups than any other food products.

FEEDS

There was no shortage of feedstuffs during the year and the quality was satisfactory.

Maize is the grain most used in poultry feeding, forming 50 per cent. or more of the total feed consumed. The price is therefore of the greatest importance to poultry producers. The present high price for this commodity is forcing some producers out of business or (where possible) to grow their own supplies, thus adding to surpluses. Yellow maize is desirable for laying stock and white maize for broiler production.

Munga is used to some extent and is an excellent feed. Cassava also is used where economic conditions warrant. Protein feeds, as has been stressed previously in these reports, could be greatly improved by the use of soy-bean cake in the place of groundnut cake. It is hoped that the interest now being shown in soyas will lead eventually to the production of cake which will make possible a considerable improvement in the nutrition of poultry and pigs. Meanwhile it is proposed to experiment with available protein feeds based on the amino acids content, adjusting deficiencies by the use of synthetic amino acids.

IMPORTS

The imports of dressed poultry declined to less than 25 per cent. of the previous year and consisted entirely of turkeys. Live poultry imported consisted of day-old chicks for breeding purposes for stock improvement.

Some liquid egg was imported for bakers' requirements owing to a local shortage.

EXPORTS

The export of day-old chicks to neighbouring territories declined somewhat as might be expected owing to conditions in the Congo and Kenya, two of the largest importers.

The export of dressed poultry and eggs both increased appreciably.

Total imports amounted to £10,276 in value and exports to £39,300, a favourable balance of £29,024.

The following tables give the details of the imports and exports of poultry products for the Federation from August, 1961, to July, 1962, inclusive, and the number of poultry, poultry products produced and value for 1961.

TABLE I.—IMPORTS

Article and Country of Origin	*Quantity*	*Value*
Poultry, live (No.):		£
United States of America	4,100	892
United Kingdom	1,788	690
Republic of South Africa	1,159	171
TOTAL	7,047	1,753
Poultry, dressed or killed (lb.):		
Republic of South Africa	47,297	6,436
Tanganyika	382	68
TOTAL	47,679	6,504
Eggs in shell (doz.):		
Republic of South Africa	1,994	306
Bechuanaland	296	44
Kenya	150	24
United States of America	134	126
United Kingdom	—	—
TOTAL	2,574	500
Eggs, liquid, frozen or dried (lb.):		
Republic of South Africa	19,220	1,741
Netherlands	149	48
United Kingdom	60	44
TOTAL	19,429	1,833

Table II.—EXPORTS

Article and Country of Destination	Domestic Produce		Re-Exports	
	Quantity	Value £	Quantity	Value £
Poultry, live (No.):				
Congo	64,791	11,228	—	—
Kenya	51,185	7,039	—	—
Moçambique	19,506	2,239	—	—
Tanganyika	4,900	596	—	—
Uganda	1,975	299	—	—
Ghana	300	41	—	—
Total	142,657	21,442	—	—
Poultry, dressed (lb.):				
Congo	46,519	9,120	—	—
Moçambique	883	204	—	—
Total	47,402	9,324	—	—
Eggs in shell (doz.):				
Congo	8,658	2,012	600	152
Moçambique	2,793	498	—	—
Bechuanaland	120	38	—	—
Total	11,571	2,548	600	152
Eggs, liquid, frozen or dried (lb.)	—	—	—	—

Table III.—NUMBERS OF POULTRY, POULTRY PRODUCTS, AND VALUE, IN 1961

	Southern Rhodesia	Northern Rhodesia
Fowls:		
Laying hens	318,118	106,764
Other poultry	433,338	128,864
Total	751,456	235,628
Ducks	31,088	5,192
Geese	7,452	1,447
Turkeys	26,455	6,889
Hen eggs sold: No. (doz.)	2,731,638	982,695
Value (£)	441,490	177,393
Table birds sold: Wt. (lb.)	1,914,988	363,662
Value (£)	313,385	67,716
Day-old chicks sold: No.	1,109,951	77,428
Value (£)	96,923	6,025

The numbers of fowls have increased in Southern Rhodesia and declined slightly in Northern Rhodesia. Other poultry remained at approximately the same level as last year. Eggs, table poultry and day-old chicks sold in Southern Rhodesia all increased appreciably. Table poultry sold increased in Northern Rhodesia, whereas eggs and day-old chicks declined. From the statistics available, the total value of eggs, table poultry and day-old chicks sold in the Federation was £1,102,932.

GWEBI COLLEGE

The Forty-second Annual Official Egg-laying Test concluded on 30th January, 1962; a full report on it was published in the March/April issue of the *Rhodesia Agricultural Journal*. The results were very satisfactory and showed a marked improvement in production on a survival basis with average production of 223.55 eggs per bird in the 336 days. The mortality was slightly above normal at 15 per cent. which affected the hen-housed average at 190 eggs per bird.

It is noticeable that some breeders maintain a high standard persistently, due to careful selective breeding, as illustrated by the fact that the leading team this year averaged 236.6 eggs per bird with no mortality in the 336 days.

The food consumed per dozen eggs produced is still higher than desirable.

The Forty-third Test commenced on March 1st and is progressing satisfactorily.

Station Stock

The breeding of inbred lines of White Leghorn and New Hampshire stock continued and again a few first crosses were bred to test the stability of the production results. The 40 cross pullets to date have performed exceptionally well. They reached 50 per cent. production at 168 days of age, rose to a peak of 93 per cent. production, remained at over 80 per cent. for four months and at 75 per cent. for two months to date. The hen-housed average is 152 eggs in 194 days. This year 500 of these pullets were bred to verify these excellent results on a larger scale, and if satisfactory this stock will be invaluable as controls for research in all directions because of their known genetic ability.

A research programme on lighting and nutrition has been drawn up to commence next season.

The stock on hand is approximately 2,500 and eggs have been supplied to the College hostel and Salisbury hospitals.

Educational

First-year students were given a programme of 42 lectures on Poultry Husbandry and practical instruction. During the absence of the lecturer overseas the course was given by the Poultry Officer stationed in Lusaka.

MATOPOS RESEARCH STATION

Construction of a new building for broiler research continued after a lapse. It should be completed early in 1963.

The breeding work on broiler production received a setback owing to an outbreak of chronic respiratory disease.

An experiment to gauge the effect of dubbing (comb removal) on layers in cages was carried out. Results were inconclusive.

The Third Matopos Commercial Laying Test ended on January 30th and the results, which were quite satisfactory, were published in the March/April issue of the *Rhodesia Agricultural Journal*.

SPECIALIST ADVISORY WORK

The demand for the services of the officers of this Branch was well maintained and in all areas as much specialist advice was given on farms as funds would permit. Some 600 farm visits were made of which over half were in Northern Rhodesia. Numerous visits to offices and the research stations were made by farmers. All meetings of the poultry committees of the Rhodesia National Farmers' Union were attended as well as meetings of the various poultry associations and clubs.

All poultry shows were judged by Poultry Officers.

The Chief Poultry Officer visited Northern Rhodesia on three occasions and Matabeleland on six occasions to keep in touch with the poultry work and farmers in those areas.

The Poultry Officer from Northern Rhodesia lectured at Gwebi College and spent several days visiting poultry breeders in Mashonaland.

VETERINARY

The Field Service of the Veterinary Department carried out all the testing of breeding stock for B.W.D. and fowl typhoid on farms selling poultry in Southern Rhodesia. Results shows there is a very low incidence of these diseases in European breeding flocks in Southern Rhodesia.

Voluntary testing was also carried out in Northern Rhodesia by the Veterinary Department in that Territory.

The improvement in the incidence of chronic respiratory disease reported last year has been maintained.

Newcastle disease in Northern Rhodesia must be considered as enzootic in African areas according to the Northern Rhodesia Director of Veterinary Services, but there have been no oubreaks on European farms where vaccinations are carried out. The number of doses sold increased again this year.

Fowl pox and coccidiosis are both diseases now well under control on well-managed farms.

There were several small outbreaks of fowl cholera in African-owned stock in Southern Rhodesia and in one European-owned flock. A slaughter and compensation policy is adopted for this disease.

No outbreaks of new or other serious poultry diseases were reported and in general the disease position is very satisfactory. The major cause of loss is still the malignant leucosis complex.

STAFF

During the whole year the lecturer in poultry at Gwebi College was absent in California studying poultry genetics under a Ford Foundation Grant. He returned in September, having successfully completed a thesis for his M.Sc. degree.

Miss Lawrence, for 17 years clerk in the Head Office, Poultry Branch, retired. Her valuable work and devotion to duty is gratefully acknowledged.

She was replaced by Miss Irwin whose duties also include *Rhodesia Agricultural Journal* work.

PASTURE RESEARCH AND ECOLOGY

INTRODUCTION

The season generally was a difficult one and particularly so in the south-west, where the effect of a series of drought years has been greatly aggravated by the foot-and-mouth quarantine and overstocking, which followed restrictions on the movement of livestock. In these parts Harvester termites have become much more conspicuous in recent years. They constitute a serious menace and are responsible for taking a large proportion of the available grazing. This is very obvious in the grazing control experiments at Tuli. Elsewhere there was generally sufficient rain for the veld and over most o fthe Colony the grazing is fair.

It was very disappointing to see how much veld was burned in August and even earlier this year. Early burning is a most pernicious practice which encourages shrub growth and bush encroachment. Veld burning should not be carried out until after the beginning of October except in the case of vleis which are wet enough to grow good grass immediately after being burned.

THE RESEARCH STATIONS

At *Grasslands* work on the plants in the Introduction Nursery continued and the collection has been increased by the addition of several new and interesting species of grasses and legumes.

The grasses in this nursery are gradually being put through a series of screening trials in which they are subjected to different intensities of grazing and cutting and with the co-operation of the Tobacco Research Board of Rhodesia and Nyasaland, the most promising are being tested for their resistance to root-knot and other eelworms and for their value in the tobacco rotation.

Some 120 grasses are being evaluated under differential cutting and grazing management. There is a particular need to find palatable, free-seeding grasses which can be grazed extensively during the rains and which are not susceptible to nematode attack. Certain Paspalum species are showing much promise in this regard.

Seventy-eight pasture legumes likely to be of use in sandveld agriculture were under observation in nursery plantings. Some twenty appear to merit further trial. One of these, *Teramnus uncinatus,* was selected for use in a study of the effects of compost and of various major and minor nutrients on yields.

Six strains of legume Rhizobia for lucerne are being compared in a field trial under irrigation.

Thirty-six varieties of cereals are being compared for fodder yields under irrigation. These include the higher yielding varieties from a similar trial carried out in 1961.

In management experiments Sabi Panicum (a local variety of *Panicum maximum*), for the fourth season running, yielded more when grown in 3-ft. rows than when grown in a close sward. However, in another newly established experiment, in which the effects on yield of growing Sabi Panicum in a close sward or in 3-ft. rows with and without inter-row cultivation is being studied, the total seasonal yields from two harvests in the first season were similar in all three treatments. There were, however, differences in treatment effects with each cut. Yields were reduced slightly by row-planting without cultivating in the first cut and increased slightly by row-planting with or without cultivation in the second cut. A further experiment on Sabi Panicum to study the effects of root-pruning has been started.

Sabi Panicum has been found to be particularly valuable for foggage grazing. Previous and current studies indicate that the stage of development attained, at the start of the dormant season, appears to have a strong influence on the amount and quality of usable foggage. Studies are being made of changes in the amount and protein content of green leaf, dry leaf and stem in foggage in a small-plot experiment. The effect of stocking the foggage at two rates (1½ acres and ¾ acre per yearling steer) and of feeding a daily supplement of 20 lb. of green oats and/or 1 lb. of maize-meal is being assessed in large-scale grazing trials.

The results to date are shown below and emphasize the need to balance protein-rich supplements with readily assimilable carbohydrates.

Effects of stocking rate and various supplementary feeds on liveweight changes of yearling Africander steers grazing Sabi Panicum foggage (13th June to 19th September, 1962).

	Stocking Rate *1 steer to 1½ acres*	 *1 steer to ¾ acre*	*Mean*
	lb.	*lb.*	*lb.*
No supplement	+ 22	−16	+ 3
1 lb. maize-meal per head per day	+ 15	− 5	+ 5
20 lb. green oats per head per day	+ 54	+48	+51
20 lb. green oats and 1 lb. maize-meal per head per day	+109	+76	+92
MEAN	+ 50	+26	

It was found that burning Katambora Rhodes Grass instead of mowing it to remove the residue of dead herbage at the end of the dry season, resulted in slightly reduced yields in the next season.

Six rhizomatous grasses namely Nile Grass, *Acroceros macrum*, Paraguay, *Paspalum notatum*, three selections of local Cynodon spp., and Coastal Bermuda Grass are being compared for yields. Paraguay *Paspalum notatum*, gave the highest yield in the past season. Coastal Bermuda grass gave the lowest yield.

At *Matopos* the main emphasis at present is on the writing up of the work carried out since the beginning of the Veld Management programme there. Progress is hampered by staff shortages and by the fact that the Senior Pasture Research Officer, who was away for six months on an F.A.O. Fellowship in India and Australia is now acting for the officer in charge who is on leave. Despite these difficulties progress is being made and work on a comprehensive report has been started.

At *Tuli* work was reduced as a result of cuts in the votes for labour and rations. For the present, all developmental work, as well as the ring-barking and root-system studies have had to be suspended.

A build-up of Harvester termites (*Hodotermes* sp.) in the grazing camps has reached serious proportions and will have to be dealt with urgently if the trials are to be continued.

At *Nyamandhlovu* in the "3 herds in the 4 paddocks" grazing trial, the first three-year period of grazing was completed in December, 1961. The liveweight gains for the period June, 1959, to June, 1961, show the usual relation between stocking rate, liveweight gain per individual animal and liveweight gain per acre, but it is significant that the animals in treatments 6, 7 and 8, in which the weight gains per acre were lowest, all reached ± 1,000 lb. liveweight at ± 3½ years despite the serious drought of 1959/60. The liveweight gains for the period June, 1959, to June/July, 1961, were as follows:

Treatment	*Actual Stocking Rate*	*Live-wt. gain per animal*	*Live-wt. gain per acre*
		(lb.)	*(lb.)*
1	4½	368	81·78
2	5¼	384	73·14
3	6	401	66·83
4	7½	490	65·33
5	9	457	50·78
6	11¼	511	45·42
7	15	493	32·87
8	18¾	522	27·84

At *Henderson* very promising and practical results have been obtained with techniques of large-scale establishment of perennial legumes and their use in conjunction with grass pastures and veld for the rearing and fattening of beef steers.

From a great variety of species used in the preliminary trials, three outstanding legumes were selected and are being used in field-scale grazing trials. These are *Desmodium discolor, D. intortum* and *Cajanus indicus* (Dahl).

Weaner steers grazing a total of 1.4 acres per individual of veld and dahl made an average gain during the dry season of 20 lb. liveweight. (The dahl was drilled in hedgerows in *Hyparrhenia* grassland and each 1.4 acres included ¼ acre of dahl.)

The 80-acre small-scale intensive unit is now in full swing and is supported by collateral trials in which stock, crops and pastures are involved. In these collateral trials, an attempt is being made to reach much higher levels of production than is possible in the 80-acre unit and to study the economics of this high-level production which is achieved by increased rates of fertilization.

At *Melsetter* the entire programme of the Eastern Highlands Research Station was reorientated in order to give more emphasis to work with beef cattle and sheep on veld and on pastures, and to horticulture. To give effect to the new policy and to enable the small staff (two men) to devote their full attention to the new work, it was decided to dispose of the dairy herd, which was sold by public auction early in September.

In Hill Veld Improvement trials clover and kikuyu have been successfully established without any costly preparatory cultivation. In the successful treatment, after a fierce burn in November, lime and superphosphate were broadcast at the rate of 2 tons and 400 lb. per acre respectively. Kikuyu sprigs were then "dibbled" in lines a yard apart, and New Zealand Wild White Clover was broadcast at the rate of 6 lb. per acre. Where clover was planted in "hills" or in drills results were not as good. It was found that unless both lime and phosphate were applied establishment of the clover was very poor.

Introduction of perennial legumes such as *Cajanus indicus* and *Desmodium discolor* into the veld as a preliminary step in the improvement programme is being tried, though first attempts were thwarted by wild pig. It appears necessary to correct lime deficiencies and to apply phosphates to establish either of these legumes in Melsetter. *Desmodium discolor* retained its leaf throughout the winter and into the spring at Melsetter this year when conditions were exceptionally cold and dry.

This work is expected to have considerable local application for the improvement of the grazing on firebreaks and waste land on forestry and wattle estates. At present the firebreaks are maintained by burning each autumn. If they can be converted into productive pasture capable of being intensively grazed, the risk of disastrous fires always associated with the burning of firebreaks, will be eliminated. Seeding strains of Kikuyu and other suitable grasses for use in this project are being sought.

In fertilizer trials on Kikuyu/clover and Kikuyu/no clover pastures there was in the first year a much greater response to nitrogen in the clover pasture, and the overall yields from that pasture were 104 per cent. higher than those in the no clover pasture. 500 lb. C.A.N. was required in no clover plots to equal the yield in the other pasture where no C.A.N. was applied. This should be ascribed in part only to the action of clover, as the younger clover-free pasture may have been affected by the renovation. In 1961/62 only 200 lb. C.A.N. was needed to equalize the yield. It was noted that the high dressings of nitrogen greatly reduced the clover population during the first season. Response to high nitrogen application on these plots the following year was greater than before.

With regard to the protein content, in general increasing applications of nitrogen gave increased protein.

The first cut produced more protein than the second cut, not only because the total green weight was greater, but because the protein content was considerably higher. In the case of the clover plots the average protein content of the first cut was 19.3 per cent. and for the second 11.7 per cent. In the no clover plots the averages were 17.4 per cent. and 12.6 per cent. In both pastures the protein content was lowest where phosphate, lime and potash had been applied together, and the highest in the phosphate only plots.

A group of Herefords on dahl and Napier appear to have come through the winter better than those on veld or Kikuyu. The Kikuyu group after growing very well during the summer and autumn slowed down sharply in June. It is possible that fouling was responsible because the animals have been run at a very high stocking rate.

(*Note:* At present it is not possible to weigh steers at Melsetter and only weight band measurements have been taken. Because of the high degree of error involved in these measuremnets it is impossible to place much reliance on the figures obtained. This will shortly be corrected as a weighbridge is being installed.)

PASTURE SEEDS

The following table shows the sales of Pasture Grass Seeds by the Farmers' Co-op. since 1954, the year in which the Rhodesia Pasture Seed Growers Association was formed. The figures are the total amount of certified and uncertified seed of each registered variety sold by the Co-op. to the 31st March each year. They do not include seed sold privately or exchanged between growers or seed sold by other selling organizations and, except in the case of Ermelo Weeping Love Grass (some seed of which is imported) all are locally grown.

	Katambora Rhodes Grass	*Giant Rhodes Grass*	*Ermelo Weeping Love Grass*	*Bambatsi Panicum*	*Sabi Panicum*	*Total*
1954–55 . . .	2,999	1,581	—	1,016	—	5,596
1955–56 . . .	10,355	3,496	—	1,515	—	15,366
1956–57 . . .	23,101	4,044	25,219	1,770	—	54,134
1957–58 . . .	36,561	3,535	16,380	861	—	57,337
1958–59 . . .	60,889	6,332	28,607	1,412	96	97,336
1959–60 . . .	55,831	29,520	25,671	263	461	111,746
1960–61 . . .	82,356	15,217	28,199	10	1,804	127,586
1961–62 . . .	69,161	24,276	31,232	—	6,764	131,433
TOTAL . .	341,253	88,001	155,308	6,847	9,125	600,534

The table shows that in five seasons a total of just over 300¼ tons of seed was sold of which considerably more than half was Katambora Rhodes Grass seed.

Katambora Rhodes Grass, Ermelo Weeping Love Grass and Sabi Panicum are at present the only grasses recommended by the Tobacco Research Board for use in the tobacco rotation. This is because of their remarkable resistance to root-knot eelworm infection and their consequent ability to reduce the root-knot eelworm population to very low levels when grown in the rotation for this purpose.

While fairly large quantities of the seed of Katambora Rhodes Grass are now grown in the Republic of South Africa for use there, our local growers are easily able to supply the internal demand and there is no need to import supplies of either Katambora Rhodes Grass or Sabi Panicum.

Ermelo Weeping Love Grass on the other hand is a poor seeder when grown in close stands under summer rainfall in the climate of Southern Rhodesia and so to meet the demand that exists for this grass, seed is imported in fairly large quantities from the Republic of South Africa. Rhodesian growers have shown that it is possible to obtain very large seed yields when this grass is grown under irrigation for seed production in the cool winter months, and it is desirable that the production of home-grown seed should be stepped up in this way to a level that would render importation unnecessary, or failing this, that Katambora Rhodes Grass or Sabi Panicum seed should be used to make good the shortfall in home-grown Love Grass.

Sabi Panicum, only recently released, is regarded as an extremely good grass by the Tobacco Research Board and in addition is proving to be one of the best grasses for foggage grazing during the dry season. It is extremely adaptable and thrives under a wide range of habitat and soil conditions. The figures of seed sales show how quickly it is gaining popularity.

Bambatsi Panicum on the other hand is losing favour because it is not suitable for use in the tobacco rotation and because its habitat requirements are rather specific. It favours heavy soils in the warmer parts and does not flourish on the granite sandveld in Mashonaland. It is probably the best grass for the black soils at Matopos and is proving very useful in parts of New South Wales and elsewhere in Australia.

Giant Rhodes Grass, which is likewise quite unsuitable in the Tobacco rotation is a valuable and popular pasture species in the warmer, high-rainfall areas. Seed production of this variety has shown a considerable increase in the past three seasons.

It is of interest that while Giant Rhodes Grass originates in Tanganyika whence it was introduced by Mr. S. D. Timson, of the Chief Agriculturist's Branch in 1941, Katambora Rhodes Grass, Bambatsi Panicum and Sabi Panicum are all Rhodesian varieties originally discovered and introduced into cultivation by the present Chief Pasture Research Officer. Ermelo Weeping Love Grass is an introduction from the cool highveld of the Republic of South Africa, where it is indigenous and is widely cultivated.

PASTURE COMPETITIONS

Pasture competitions were held during the year in the North and South Wedza and in the Beatrice I.C.A.'s. Despite the drought, which seriously affected grass growth during the early part of the season, the entries were of a very high standard. There can be no doubt that a tremendous improvement in the technique of establishment and management of pastures has been brought about by the keenness of the participants in these competitions. The time spent in judging and the field day or afternoon which follows the judging, allow a very free and comprehensive discussion of the complex problems involved in management and utilization which is of great value both to the competitors and to the judges. Even more valuable perhaps is that farmers are enabled to see really good pastures grown by farmers in their own districts. This provides a standard and something to aim at, which is of great help to the beginner.

SPECIALIST ADVISORY OFFICERS IN VELD AND PASTURE MANAGEMENT

If real progress is to be made in the general standard of management of veld grazing and in the utilization of pastures, specially trained officers are needed to advise the Conservation and Extension staff, to lecture at extension courses, to attend farmers' days and to assist in the thousand and one ways which could help in keeping both the extension staff and the farmer up to date with the latest findings of research.

The importance of this approach was stressed again at the Pasture Officers' Conference held at Henderson Research Station in January, 1962, at the Inter-departmental Conference of Pasture Workers in Bulawayo, January/February, 1962, and finally in the report of the sub-committee of the Southern African Regional Committee for the Conservation and Utilization of the Soil on bush and bush encroachment, in May, 1962.

Bush and Bush Encroachment

At the 7th Meeting of SARCCUS at Salima in Nyasaland, it was recommended (Rec. 2) that "In view of the serious threat which bush encroachment presents in many territories and the urgent need for effective means of controlling encroachment and eradicating bush, that a sub-committee of one member, Dr. O. West, be appointed to investigate—

(1) the importance of this problem in the various territories of Southern Africa;
(2) the progress made towards its solution in each case; and
(3) the possibility of establishing a co-ordinated research programme."

The sub-committee presented its report at the 8th Meeting of SARCCUS at the Victoria Falls in May. As a result of this report, SARCCUS recommended (Rec. 4) that Dr. O. West be appointed as a standing sub-committee of one member, to continue with the investigation of the problem in the various territories of Southern Africa and as far as possible, with the co-operation of member governments, to establish a co-ordinated research programme; that this sub-committee be recognized as the official SARCCUS consultant available to co-ordinate information contributed by member governments and for correspondents on request and that each member government be invited to appoint an official correspondent for the purpose of assisting the sub-committee.

Further SARCCUS resolved (Res. 3) that *Bush Control* be removed from the general heading of *Pastures and Associated Water Supplies* and be dealt with in future as an independent subject in order to stress its importance.

This is an important step forward and if taken advantage of, could be of great benefit to all member territories of SARCCUS.

CONFERENCES

The Annual Pasture Research Officers' Conference was held at the Henderson Research Station on the 11th and 12th January. Much of the time of this conference was spent in discussing the pasture research programme in progress at the Henderson Research Station and in considering problems and policy common to pasture workers in Southern Rhodesia. The delegates present were shown the field work in progress and were greately impressed by the excellent stands of perennial legumes, namely *Desmodium discolor, D. intortum* and *Cajanus indicus* used in the beef steer raising and fattening trials.

The first Inter-departmental Conference of Pasture Workers was held in Bulawayo from the 29th January to the 2nd February. This conference, which was an extremely useful one, was attended by 12 delegates from each of the three departments of Native Agriculture (Southern Rhodesia), the Federal departments of Research and Specialist Services and Conservation and Extension, and by observers from the Northern Rhodesia Department of African Agriculture and from the Agricultural Research Council of Rhodesia and Nyasaland. The proceedings of this conference are about to be published.

GENERAL

During the year the Chief Pasture Research Officer served on ten departmental and co-ordinating committees. In addition he lectured at the following meetings:

West Lomagundi Farmers' Association.
The Hunyani Group of I.C.A.'s.
Sabi Valley I.C.A.
The Gwanda Group of I.C.A.'s.
The Norton I.C.A.

He lectured at courses of the Department of Conservation and Extension on Veld Management and Bush Encroachment, and assisted that department by visiting Conservation and Extension officers in their districts and assisting them in the preparation of papers on the vegetation of their areas. He toured the wattle estates in the Eastern Districts with officials of the Department of Conservation and Extension to advise on grazing management and the development of a livestock section complementary to the wattle enterprise, and he advised and assisted in the designing of co-operative experiments.

He assisted the Lands Depatment by reporting on the condition of River Ranch, Sinoia, and the Department of Wild Life Conservation by advising on a grazing improvement programme for the Robert MacIlwaine National Park.

He assisted the Advisory Committee on the economic resources of Southern Rhodesia by serving on one of its working parties and by preparing memoranda and supplying information.

He edited and prepared for publication the Report on the Proceedings of the Inter-departmental Conference of Pasture Workers, to which he contributed a paper.

He visited Pretoria in connexion with the Report on Bush and Bush Encroachment which he prepared for SARCCUS and presented at the 8th ordinary meeting of that body. He visited the Masera Grazing Trials of the Department of Native Agriculture and accompanied officials of that department on a reconnaissance in the Beitbridge district. He also made regular visits to all the research stations of the Department.

REPORTS AND PUBLICATIONS

(1) "A bibliography of Papers on Pasture, Veld and Ecological subjects published by Workers in Southern Rhodesia since 1945".
(140 papers are included, many of them published in several parts.) Prepared for the Advisory Committee on the Economic Resources of Southern Rhodesia.

(2) "Report of the Sub-committee of SARCCUS on Bush and Bush Encroachment" (presented at the 8th Ordinary Meeting of SARCCUS in May, 1962. To be published by SARCCUS in *African Soils.*

(3) "Factors affecting the Carrying Capacity of Veld Grazing" (Paper read at the Inter-departmental Conference of Pasture Workers, Bulawayo, January/February, 1962).

BOTANY, PLANT PATHOLOGY AND SEED SERVICES

INTRODUCTION

The staff position of the Branch of Botany, Plant Pathology and Seed Services improved considerably, especially on the technical side, where the authorized establishment reached full strength by the appointment of Mr. W. J. N. Bichard to the post of Seed Inspector in November, 1961, and of Mr. T. Müller as Curator, Botanic Gardens in February, 1962. Two new professional posts were filled in January, 1962, by the appointments of Mr. C. Coburn as Seeds Research Officer and Mr. H. W. Aucock as Weed Research Officer. The latter officer, however, resigned after four months' service and no suitable successor for this important assignment has yet been found. The vacant post of Grass Taxonomist remained unfilled throughout the year but the pressure on our reduced cadre of professional botanists was relieved by the employment of two temporary women officers for varying periods.

Dr. G. R. Bates again acted as Assistant Director of Research and Specialist Services on two occasions during the first quarter of the year under review. He represented the Federation at the sixth meeting of the Inter-African Phytosanitary Commission at Ibadan, Nigeria, in October and was chairman of the CCTA/FAO Weed Symposium which took place at the same venue in Nigeria immediately after the phytosanitary meeting. Subsequently, he represented this Ministry at a CCTA/CSA Symposium on the Organization of Agricultural Research held at Muguga, Kenya, in December, and was a member of the Federal delegation to the 17th Session of CCTA at Abidjan, Ivory Coast, in February. During September, Dr. Bates attended the thirteenth annual meeting of the Scientific Council for Africa (C.S.A.) which also took place in Kenya.

Mr. W. E. Kerr, Officer-in-Charge, Seed Services, attended the F.A.O. Technical Meeting on Seed Production, Control and Distribution in Rome during April and submitted a paper for discussion. He then proceeded to Lisbon where he represented the Federation at the 13th Congress of the International Seed Testing Association.

Miss N. A. Fernsby attended the 1962 Seed Analysts course at Cambridge, England, during May and June and successfully passed both the practical and theoretical examinations for the diploma awarded by the National Institute of Agricultural Botany.

Officers of the Branch provided lectures on plant pathology and on seed testing, production and certification to students at the Gwebi College of Agriculture. Mr. Kerr was also responsible for a short course on seed testing and production at the Department of Agriculture, University College of Rhodesia and Nyasaland. Addresses to farmers' associations and other organizations connected with agriculture and horticulture covered a much wider field than usual and all sections of the Branch took part in these activities. Special mention can be made of a series of lectures on plant collection and herbarium techniques given by Dr. Wild to school-teachers at Bulawayo, Gwelo, Salisbury and Umtali; also of addresses by all sections of the Branch to the induction courses arranged by the Department of Conservation and Extension for new recruits. Assistance was given in judging maize and agricultural produce at the Salisbury and Umtali Agricultural Shows whilst a seed exhibit was mounted at the annual Bulawayo Show.

Volume 2 of *Kirkia,* the official journal of the Federal Herbarium, was published on schedule but printing difficulties delayed the appearance of Volume 2, part I of the *Flora Zambesiaca.* Details of the scientific articles published by officers of the Branch in local and overseas journals are appended to the appropriate sections of the following report. Two cyclostyled pamphlets were issued dealing with deciduous fruit diseases and their control.

BOTANY

Herbarium

Accessions at 9451 show a decline of more than 3,500 over the previous year. Some irregularity in the intake of new material is to be expected, especially in view of the reduced professional staff. More than half the specimens dealt with were for naming, the rest being duplicates from other herbaria in Africa, Europe and America. A considerable proportion of the local material was sent in by Government departments from the three Territories of the Federation. It is notable to record that more specimens were received from Northern than from Southern Rhodesia. Important collections were also received from official agencies in Bechuanaland, Moçambique and Angola.

Material sent away on loan for specialist study included *Vernonia* to Mr. C. Earl Smith, Beltsville; *Lagarosiphon* and *Burmannia* to Mrs. Mauve, Pretoria; *Eulophia* and some ferns to the Bolus Herbarium, Cape Town; *Isoetes, Ophioglossum* and *Lycopodium* to Mr. C. Reed, Baltimore; *Viola* to Stockholm; *Wrightia* to Missouri; *Pterocarpus* and *Lonchocarpus* to Lisbon, and *Harpagophytum* to Hamburg. Other large collections were dispatched to Kew, the British Museum and Coimbra (Portugal) in connexion with the *Flora Zambesiaca* project.

Resident botanists made six collecting expeditions of varying duration to carefully selected regions in Southern Rhodesia. One of these embraced the Great Dyke in the Sebakwe and Ngesi areas and was designed to obtain information on the adaptation of plant species to metalliferous soils. Other important visits were to the Nyumguarara Valley, Stapleford, Nuanetsi and Mphoengs.

Despite the unfortunate delay in publication of Volume 2, part I of the *Flora Zambesiaca,* the planned programme of this long-term project progressed satisfactorily. Work on the *Rhamnaceae* is well advanced whilst a start has been made on the *Compositeae.*

Volume 2 of our official botanical journal *Kirkia* appeared in March. Further exchange arrangements have been made through the medium of this publication and our library accessions of other useful botanical journals continue to increase accordingly. Sufficient articles have already been received to ensure that Volume 3 will maintain the standard of its predecessors.

It has been possible to catalogue thoroughly the books and periodicals of the Herbarium library in the course of the year and to commence a similar exercise with the extensive reprint collection. Welcome additions to the library include a large and valuable set of reprints donated by Mr. A. W. Exell and a smaller collection from Dr. E. Launert.

New Herbarium

After long and frustrating delays it is pleasing to be able to report that the final plans for a new Herbarium building have been drawn up and approved. Construction is expected to begin shortly on a delightfully situated site in the Botanic Garden. All being well, this long-awaited and much-needed new building should be a reality by September, 1963.

Botanic Garden

Since the arrival of the new Curator in February a tremendous amount of planning and development has gone into the botanic garden project. With the assistance of a recognized landscape expert a detailed layout for the garden was drawn up together, thanks to the co-operation of the Irrigation Department, with a comprehensive water reticulation scheme covering nearly 50 acres of the southern section of the area. Meanwhile correspondence has been established with 230 botanic gardens in all parts of the world especially those in comparable climatic regions, and arrangements are in train for organizing exchanges of living plant material and seed. In fact, seed from several sub-tropical countries has already arrived. A carefully planned planting programme for indigenous trees and shrubs has also been prepared.

On the development side the entire 120 acres of Brachystegia woodland were selectively cleared and all senile and diseased trees, coppice growth and unwanted saplings were removed. Where necessary tree surgery is being employed to retain good specimens. In this and other parts of the garden nearly 1,000 tons of stones and boulders were lifted to facilitate mechanized grass cutting. Natural rock outcrops are being developed as rockeries. Trenches for the main water reticulation system have been completed. In addition most of the natural grass has been cut and the previously cleared areas maintained in good condition.

Grateful acknowledgement must be recorded for the considerable assistance provided by the Federal Prisons Department in this work.

Economic Botany

Weeds.—It was a serious disappointment that the Weed Research Officer resigned after only four months' service to take up a more lucrative post with a commercial agricultural organization. During his short stay with the Branch he studied our previous work in this field preparatory to undertaking a more comprehensive research programme on major weed problems. He was able to summarize the literature on several weeds and their control and, whilst conducting this survey, prepared a series of cyclostyled articles on the recognition and control of *Oxalis* spp., *Cyperus esculentus* and *Euphorbia prostrata*.

More inquiries than usual were received on the identification and control of weeds in agricultural and horticultural crops. Considerable interest was shown in aquatic weeds and, in this connexion, two new outbreaks of *Salvinia auriculata* were confirmed. One of these occurred in the upper reaches of the Prince Edward Dam, Salisbury, and was estimated to be of some six months' standing when examined. Urgent and vigorous eradication measures were taken and appear to have been successful. The second outbreak was discovered on the Ndola "dambo" where equally vigorous control measures are also reported to have eliminated the pest. Close touch was maintained with research workers studying the major *Salvinia auriculata* infestation on Lake Kariba both at a personal level and through the Kariba Lake Co-ordinating Committee. Recent surveys confirm the slower development of this vast infestation. In some parts of the lake an appreciable amount of the original *Salvinia* is reported to have disappeared as a result of increased wave action.

Lantana camara was proclaimed a noxious weed in Southern Rhodesia in June. This was followed by a spate of inquiries concerning suitable eradication measures.

The handbook entitled "Harmful Aquatic Plants in Africa and Madagascar", by Dr. H. Wild, was published in Volume 2 of *Kirkia* and issued separately by CCTA/CSA as their Publication No. 73 in February.

Poisonous Plants

Identifications of plants known or suspected to be poisonous to stock were again made on behalf of the Department of Veterinary Services. This work is to be the subject of a joint bulletin for which eleven illustrations of known toxic plants occurring in Southern Rhodesia have already been prepared by a local artist under the direction of this Branch.

Many plants suspected of possessing poisonous properties were also named for the Government Analyst.

Medicinal Plants

Collections of Barotseland plants used medicinally by the local inhabitants were identified on behalf of the Rhodes-Livingstone Museum working in conjunction with the Squibb Institute of Medical Research.

Visitors

Several local botanists and research workers from other departments and institutions in the Federation used the herbarium facilities in the course of the year. Botanists from America, England, East Africa and Angola were also accommodated.

PUBLICATIONS

(1) "Harmful Aquatic Plants in Africa and Madagascar". H. Wild in *Kirkia* 2, 1-66 (1961). Publication No. 73 of CCTA/CSA.

(2) "A Statistical Anaylysis of the Flora Zambesiaca". A. W. Exell and H. Wild in *Kirkia* 2, 108-130 (1961).

(3) "Vitaceae from the Flora Zambesiaca Area". H. Wild and R. B. Drummond in *Kirkia* 2, 132-143 (1961).

(4) *Kirkia*, vol. 2, ed. H. Wild (April 1962). Government Printer, Salisbury.

(5) "A Vegetation Map of the Chimanimani National Park. R. Goodier and J. B. Phipps in *Kirkia* 3, 2-7 (1962).

(6) Biographical Notes on Botanical Collectors in the Federation of Rhodesia and Nyasaland. H. Wild in Comptes Rendus de la IVe Reunion Pleniere de L'AETFAT: 161-173 (Lisbon, 1961).

PLANT PATHOLOGY

Advisory

Despite uneven weather conditions the disease pattern amongst summer crops was generally satisfactory, no exceptional outbreaks being reported. Aphid-borne virus diseases were less in evidence than in previous seasons.

The number of specimens dealt with by the Salisbury and Umtali laboratories increased substantially to a new record total of 1,214 (910 in 1961). Some 80 new disease or host records were obtained amongst which the following deserve particular mention.

Ripe spot of apple due to *Gloeosporium perennans* Zeller and Childs; leaf spot of apple and of *Pyracantha coccinea* due to *Fabraea maculata* (Lev.) Atk.; loose kernel smut and grey leaf spot of sorghum due respectively to *Sphacelotheca cruenta* (Kuehn) Potter, and *Cercospora sorghi* Ell. and Ev.; white rust of sunflower due to *Albugo tragopogonis* S. F. Gray; leaf spot of gladiolus due to *Curvularia trifolii* (Kauffm.) Boed. f. sp. *gladioli* Parm. and Lutt.; sweet potato scurf due to *Monilochaetes infuscans* Hals.; bacterial stem rot of dahlia due to *Erwinia aroidea* (Town.) Holl.; and blue stain of soybean seed due to *Cercospora kikuchii* (Mat. and Tomoy.) W. M. Gardner. Additions to the host range of the root rotting fungus *Armillaria mellea* (Fr.) Quel., include *Pinus radiata* and mango. The giant witchweed, *Striga forbesii* was recorded for the first time parasitizing sorghum.

Tobacco

Most of the seedbed disorders dealt with were associated with the use, and probable misuse, of dimethoate systemic insecticides. A few cases of anthracnose and wildfire were reported on seedlings. The incidence of the aphid-borne virus diseases, bushy top and rosette was surprisingly low even in crops heavily infested with the vector. *Alternaria* spot was observed on cigar tobacco.

Potatoes

Late blight appeared earlier than usual in the Eastern Districts and Mashonaland but was checked in most areas by spells of dry weather during January and February. Nevertheless, the disease persisted into the first irrigation crop and one exceptional outbreak occurred as late as September in a second irrigation crop grown with overhead watering. No serious losses due to late blight were reported in the majority of summer crops. First irrigation crops, however, were more severely attacked than usual and heavy losses were sustained by some growers. Several outbreaks of bacterial wilt in irrigated crops were investigated and all were traced to the unwitting use of infected seed tubers. Two sources of infection were uncovered, the first being an Eastern Districts grower who sold his seed crop without certification. The second proved to be a substantial consignment of seed potatoes imported from Kenya which, judged by field inspections of the growing crops must have contained at least 15 per cent. bacterial wilt infection. The symptoms of the disease in these outbreaks differed from those previously observed in bacterial wilt infected potatoes particularly in the absence of discolouration in the vascular tissues of both stems and tubers. Specialist examination of cultures obtained from the local and Kenya seed tubers identified both isolates as *Pseudomonas solanacearum* Type 2. All previous isolations of *P. solanacearum* from various hosts in Southern Rhodesia have been either Type 1 or Type 3. Blackleg was again prevalent in crops grown from certified seed imported from Scotland and Northern Ireland. Common scab was reported more frequently than powdery scab, the Walanga variety being particularly susceptible to the former disease. Summer potato crops in the Gwelo district were attacked by powdery mildew.

Maize

Streak virus developed extensively amongst early maize under irrigation in Mashonaland although, apart from one localized outbreak at Melsetter, it was less in evidence throughout the Eastern Districts. More streak virus than usual was observed in summer crop plantings throughout the Mashonaland maize belt. Cob-rotting diseases were prevalent for the second successive year although it is possible that the tightening up of maize grading standards has made farmers more conscious of such diseases. Nevertheless, far more *Diplodia zeae* infection was recorded than in recent seasons, losses of up to 10 per cent. being reported from this particular disease. Other cob-rotting pathogens noted include the ubiquitous *Fusaria* and occasionally, *Nigrospora oryzae* and *Colletotrichum graminicola*. Tropical rust *(Puccinia polysora)* occurred on lowveld plantings without causing appreciable damage.

Cereal Crops

Interest in the possibilities of increased sorghum production led us to conduct a preliminary survey of the diseases attacking this host locally. Of the twelve diseases recognized four were new to Southern Rhodesia. Grain smut due to *Sphacelotheca sorghi* proved the most common disease which was not surprising since very few growers bothered to treat their seed with a fungicidal dressing. Loose kernel smut *(Sphacelotheca cruenta)* was extremely rare. Most of the well-known leaf diseases of sorghum were recorded but, without further study, it is difficult to estimate their relative importance in the successful production of this crop.

Maize streak virus attacked winter wheat crops at Umtali and Odzi. With the exception of plantings in the Eastern Districts and the Sabi Valley, the 1962 winter wheat crop was almost entirely free from stem rust. Leaf rust due to *Puccinia recondita* was destructive in the Sabi, many wheat varieties resistant to stem rust being completely defoliated. Leaf spot due to *Helminthosporium sativum* and root rot caused by *Scletotium rolfsii* were occasionally recorded. Late frosts damaged some crops, especially in the Mazoe Valley. *Helminthosporium* leaf spot was common on barley crops, covered smut and mildew were also recorded on this host.

Legume Crops

Root and vine rot *(Phytophthora dreschleri)* destroyed a crop of velvet beans at Old Umtali. A preliminary survey of groundnut diseases indicated that *Cercospora arachidicola* leaf spot was much more prevalent than *C. personata* leaf spot although the latter became more evident later in the season. Another leaf spotting disease caused by a species of *Phyllosticta* was frequently encountered in samples from drier parts of the country. *Fusarium* wilt of groundnuts was reported from many districts but was nowhere serious. Bacterial blight *(Pseudomonas glycinea)* was commonly encountered on soya-bean samples but mosaic virus, which is seed borne, appears to be more dangerous. Inspection of crops in variety trials showed that several varieties were infected by soya bean mosaic, the variety "Hood" carrying a very heavy infection.

Vegetables

Corynebacterium michiganense

Bacterial canker of tomato appears to be firmly established. It reappeared on most farms where outbreaks had been previously recorded. A few new cases were reported mainly in the Salisbury and Umtali districts. Serious losses from the disease were more restricted and, where growers had practised strict field hygiene a considerable measure of control was achieved. Late blight was generally less severe on tomatoes than in previous years. Most growers are successfully controlling the disease with dithiocarbamate fungicides. *Fusarium* wilt attacked three commercial plantings of tomato in November, infection being completely systemic. Circumstantial evidence suggests the disease was introduced by infected seed. The severe strain of tobacco mosaic virus which was responsible for widespread and serious losses the previous year reappeared in March but caused comparatively little damage. *Colletotrichum atramentarium* was isolated from the roots of stunted tomato plants. *Cladosporium* leaf mould, usually a disease of winter tomatoes, was recorded on plants grown under polythene during February.

The use of locally produced, certified dwarf bean seed instead of imported seed has largely overcome the problem of bacterial blight and anthracnose in crops grown for canning and deep-freeze. Scab due to *Elsinoe phaseoli* was troublesome on a few farms especially during wet weather. Ashy stem blight was serious in dwarf bean variety trials at Mazoe.

A marked reduction of *Ascochyta* blight in green pea crops is ascribed to the use of better seed, improved cultural methods and more favourable weather conditions. Downy mildew was common on such pea crops but caused little damage.

Black rot *(Xanthomonas campestris)* was of minor consequence in commercial plantings of cabbage, cauliflower and Brussels sprouts although it was frequently reported by gardeners.

Gummosis due to *Cladosporium cladosporioides* was encountered on cucumber in crops grown under polythene as well as in the open. Stem canker *(Erwinia carotovora)* of cucumber was discovered for the first time.

Late blight was again observed attacking eggplant fruits.

Black rot *(Mycosphaerella citrullina)* was recorded for the second successive year, both stem blight and fruit rot symptoms being observed. Zineb sprays gave satisfactory control.

Coffee

Eye spot and berry blotch due to *Cercospora coffeicola* were prevalent on unthrifty bushes. Physiological disorders including hot and cold disease, sun-scorch, and premature defoliation and die-back associated with overbearing, continue to be the chief problems facing coffee growers. Fusarium die-back was confined to one commercial coffee planting and is undoubtedly related to management techniques.

Deciduous Fruit

Thiram gave good control of peach leaf curl provided spray applications were made at the first signs of bud movement. Rust is now regarded as the most serious and widespread disease of stone fruits in the Eastern Districts. It can be controlled satisfactorily by Zineb.

Apple scab *(Venturia inaequalis)* which was first recorded in 1960 proved to be more widely distributed in private gardens than was originally realized. In a previously infected Melsetter orchard the 1962 crop of White Winter Pearmain apples was severely damaged by scab which also attacked other varieties including Rome Beauty, Golden Delicious and Carrington. Ripe spot *(Gloeosporium perennans)* was observed for the first time in the same Melsetter orchard on over-ripe fruit of the White Winter Pearmain variety.

A non-parasitic bark disorder of apples known as "measles" commonly affects certain apple varieties, especially Red Delicious and White Winter Pearmain, on acid soils in the Eastern Districts. Lime applications have given promising control.

Several instances of severe powdery mildew on grapes were reported. Anthracnose was also serious on late maturing varieties in many districts.

Citrus

It has been known for several years that the citrus black spot fungus, *Guignardia citricarpa,* occurs as a latent infection in many established citrus orchards in Southern Rhodesia but the more practically serious manifestation of the disease which produces dark, sunken lesions on the fruit was not discovered until October, 1961, when it was reported on Valencia Late oranges in a large orchard at Gwelo. Shortly afterwards, in November, 1961, the visible form of black spot was found attacking Valencia Late orange and Lisbon lemon fruits in a private garden at Hillside, Bulawayo. In this later outbreak, leaf spots bearing fructifications of *G. citricarpa* were also observed on both hosts.

The reasons for this sudden appearance of the more dangerous form of black spot are unknown. It is hoped to investigate this aspect of the problem more closely.

Citrus trees usually show appreciable resistance to infection by the root rotting fungus *Armillaria mellea;* however, several orange trees in a Rusape orchard were recently attacked by this disease. The infected area was previously occupied by a Eucalyptus plantation.

Sugar-cane

Isolated outbreaks of gumming disease due to *Xanthomonas vasculorum* were reported on the N. Co. 310 variety at the Triangle and Hippo Valley estates. Symptoms were atypical and it seems doubtful whether the disease will be of serious consequence under local conditions. Mosaic virus occurred on the N. Co. 293 and N. Co. 339 varieties in trial plantings at Chipinga. Infected stools were destroyed.

Flowers and Ornamentals

Investigations at the Commonwealth Mycological Institute, Kew, demonstrated that the bacterium responsible for a leaf spotting disease of Bougainvillea is a strain of *Pseudomonas stizolobii.* This disease has been frequently encountered in local nurseries since it was first recognized here in 1956. It causes severe defoliation at the start of the rainy season but can be satisfactorily controlled with Bordeaux Mixture.

A new petal blight disease of dahlia, first noted in 1961, has been ascribed to a strain of *Pseudomonas fluorescens.* Another new bacterial disease of dhalia which causes a pith rot with pronounced blackening of the external stem tissues was due to *Erwinia aroidea.* Wounds were necessary for infection.

Kromnek *(Lycopersicum* virus 3) was less in evidence than the previous year, only two cases, both in dahlias, being detected during the regular inspections of nurseries and private gardens for this disease.

Commercial carnation growers were again troubled by *Fusarium* wilt. Leaf diseases due to *Septoria dianthi* and *Alternaria dianthi* were occasionally serious.

Forestry

Needle blight of *Pinus radiata* due to *Dothistroma pini,* previously recorded as *Actinothyrium marginatum,* was found to be widespread in the Inyanga, Odzani and Vumba districts. Infection was most acute on young trees growing at higher altitudes.

P. radiata plantings over 15 years old showed relatively little infection. Earlier records of *Septoria* as a needle pathogen of *P. radiata* were re-examined and many found to be actually due to *Dothistroma pini*.

RESEARCH

Wheat

As already mentioned, 1962 was not a "rust year". Stem rust races identified in the course of routine field surveys throughout Southern Rhodesia were 21, 17, 34 and an approximate to race 279, the latter being identified from Sabi collections only. Race 34 was identified in the Salisbury summer crop but did not appear in any winter crops.

The international differential varieties were used to identify stem rust collections but evidence has accumulated to show they are not adequate to differentiate clearly local biotypes of *Puccinia graminis-tritici*. Consequently an additional range of some thirty wheat varieties all of which are represented in our current breeding programme were added to the international list in order to find varieties which more clearly differentiate races than the present standard series. The advantage of using varieties already incorporated in the breeding programme for this purpose is that any information derived from the tests is immediately available to the wheat breeders.

A study of the inheritance of resistance to stem rust in local wheats has been commenced. Its objectives include a determination of the relationships between resistance genes in the different varieties, to ascertain which genes are held in common, and to develop a series of race typing differentials to provide more accurate information than the present international series.

The International Spring Wheat Nursery comprising 592 wheat varieties and the Inter-African Uniform Rust Nursery were both planted at Salisbury during the summer. Assessments on the latter showed no change in the stem rust race position as compared with previous years although evidence was obtained that the leaf rust races had altered.

Varieties bred at Salisbury with satisfactory resistance towards locally occurring races of stem rust are Kafue, Mazoe, Marodzi, S10B1, Gabo and F568. Most of these are better adapted to irrigation, possess more resistance to lodging and have a greater yield potential than varieties previously used in Southern Rhodesia.

Potatoes

The widespread occurrence of the so-called necrotic strain of potato virus Y in certain European countries where it has been responsible for serious damage to tobacco crops led the Branch to examine many recent introductions of European potato varieties for the presence of this virus. It may also be recalled that a variant of potato virus Y known as tobacco veinal necrosis virus was discovered affecting a few tobacco plants at the Kutsage station of the Tobacco Research Board in 1961.

All inoculations from potatoes, with the exception of the Herkol variety, produced typical symptoms of normal potato virus Y when inoculated to Virginia tobacco (Hicks). Inoculations from Herkol produced symptoms similar to, but more severe than, those caused by the tobacco veinal necrosis virus on Hicks tobacco. This severe reaction was shown to be due to the presence of both potato virus X and Y in the Herkol potatoes. No sign of the necrotic strain of potato virus Y has yet been detected in local potato stocks.

Deciduous Fruit

In continued experiments using various sulphur preparations and Karathane against mildew on Rome Beauty apples better control of the disease was obtained than in previous trials despite a reduction in the number of spray applications from six to four. This is attributed to the more uniform growth flush in the latest trials following winter applications of DNOC. Karathane at 0.075 per cent. proved to be as effective as 0.3 per cent. colloidal sulphur in these trials. Observations on the trees used in the previous year's trial which received a further blanket spray of 0.3 per cent. colloidal sulphur this season showed that an efficient mildew spray schedule not only provides satisfactory control of current season leaf infection but also reduces the amount of infection overwintering in the buds.

Under high rainfall conditions Bordeaux Mixture at 8 lb./100 gals. was more effective in controlling bitter-rot of apples (White Winter Pearmain) than Maneb at 2 lb./100 gals.

Although peach rust can be adequately controlled by regular applications of 0.2 per cent. Zineb, observations suggest that such fungicidal treatments are not a complete answer to the local rust problem. Attention must also be directed to maintaining the trees in vigorous health.

Thiram and Maneb, both at 0.2 per cent. were slightly superior to 4:6:50 Bordeaux Mixture in controlling anthracnose of grapes. In addition, the organic fungicides did not leave any conspicuous spray residue.

PUBLICATIONS

(1) "Notes on Plant Diseases in Southern Rhodesia", by G. R. Bates, *Commonwealth Phytopath. News,* vol. 8, pp. 46-47 (1962).

(2) "Diseases of Groundnuts in Southern Rhodesia", by A. Rothwell, *R.A.J.*, vol. 59, p. 199, July-Aug. (1962).

SEED SERVICES

The vacant posts of Seed Research Officer and Seed Inspector were filled enabling a commencement to be made on much-needed investigations into local seed problems and to resume the regulatory services. One of the experienced seed analysts, Miss M. M. Standley, was appointed to Rhodesia House, London, whilst another, Miss N. A. Fernsby, also proceeded overseas on leave in May. These changes and movements threw an additional strain on the remaining staff of this Section and it was difficult to avoid a build-up of samples awaiting test. More than 850 visitors called at the laboratory during the year.

Laboratory

The number of samples received for examination and testing showed a further substantial increase, no less than 2,509 seed lots being handled. This figure included 27 samples from the International Seed Testing Association for uniformity disease and germination tests, and another 16 from the Entomology Branch for phytosanitary check purposes. Reports were provided on 2,482 seed samples. Ten per cent. of the total samples received for purity and germination testing failed to reach the prescribed minimum standards (the 1960/61 figure being 12.8 per cent.). Six thousand one hundred and seventy-eight germination tests were conducted, 1,600 more than the previous record figure. Thirty-five samples were submitted for special disease tests, not including other disease tests undertaken as a regular procedure with maize, wheat, tobacco, grasses, flower and vegetable seed lots required for certification and phytosanitary certificates.

Forty-one Orange International certificates, 215 phytosanitary certificates and 37 certificates of wholesomeness were issued, the latter being supplied in conjunction with the Chemistry Branch.

Three hundred and twenty-seven samples of maize seed were examined from certified crops. An increase in the inspection staff of the Seed Maize Association ensured a more regular flow of samples. Quality of the certified maize grain was maintained, the average germination of all samples being 97.2 per cent. Whilst the percentage of grain infected by *Diplodia zeae* remained low it was again widely distributed. Other important seed-borne pathogens, especially *Fusarium graminearum* and *Colletotrichum graminicola* were more frequently encountered than in the previous year.

Legislation

A detailed review of seed legislation was conducted during the year, all interested parties being consulted in the course of this lengthy exercise. New draft regulations, amending and expanding the existing schedule, were prepared and although legal difficulties in regard to their introduction under the Federal Constitution were encountered, it is hoped that these will soon be overcome.

The seed inspector visited 386 merchants, some more than once, and seized or destroyed 95 lb. and 12,777 packets of vegetable seeds which did not conform with the regulations. Another 33, 943 lb. and 3,902 packets of farm and vegetable seeds were detained pending official tests, of which 12,880 lb. and 1,289 packets were subsequently released as complying with the regulations. Four hundred and thirty-nine thousand, two hundred and eighty-six pounds of various seeds were officially sampled and sealed in accordance with the procedure required for the issue of Orange International certificates.

Seed Production

Inspection services were provided for a wider range of crops than hitherto. Sunflower, velvet bean, sugar beans, sunnhemp, cowpeas and sorghum are now being examined, mainly for field approval purposes. Crop inspectors made 800 visits to farms in Southern and Northern Rhodesia in connexion with seed crop certification or field approval duties, advisory services and the investigation of complaints. Some 4,750 acres of seed crops were inspected.

Grasses

An estimated 93,560 lb. of seed was produced from 1,309 acres of which more than 76,000 lb. has been certified. Slow sales of the previous season's record crop tended to curtail production in 1961/62 which was unfortunate since it is likely that a shortfall may soon be experienced in available stocks of certified pasture grass seed. The quality of the 1961/62 crop was satisfactory although weeds continued to be a problem.

Vegetable and Flower Seed

Bean seed crops again dominated this section of the industry, 78 per cent. of the 1,575 acres planted to vegetable and flower seeds consisting of bean varieties. Lettuce is another crop well suited for seed production in this country and some 80 acres were grown in 1961/62. Expansion of both these crops is predicted. Pea seed production on the other hand continued to decline, only 240 acres being planted this season.

Eleven acres of flower seed crops yielded 1,200 lb. of seed. Results were below expectations but prospects for such specialized seed production are considered favourable as growers gain experience.

Potatoes

Two hundred and ninety-two acres of seed potato crops were inspected of which 19 were rejected. Only two varieties, Up-to-Date and Walanga were grown for certification. Some 1,800,000 lb. of seed tubers were inspected and 7.5 per cent. were rejected for various reasons.

Bacterial wilt was more prevalent than usual amongst irrigated highveld crops following the distribution of infected seed stocks. Steps are being taken to prevent dissemination in this way.

Tobacco

Production of certified seed was estimated at 1,170 lb. or less than half that of the previous year. Of the 19 crops registered, three were rejected in the field and one seed lot failed to pass the necessary laboratory tests. More than 13,000 ounces of certified flue-cured and 1,050 ounces of certified Turkish seed were sold. Release of the new flue-cured variety Kutsaga 51 was responsible for a decline of 25 per cent. in the sale of certified seed of other varieties. Six hundred and twenty-four ounces of approved seed of the Burley 21 variety were also produced.

A scheme for the administration of the tobacco seed "bank" was devised and accepted. The scheme embraces a system for subsidizing the production of less popular varieties.

Groundnuts

The approval scheme initiated last year was greatly expanded, and some 646 acres, mainly of the varieties Valencia and Natal Common, were inspected. In addition, a full certification scheme was introduced for the first time, using a limited but carefully-selected quantity of the Mount Makulu Red variety as foundation seed.

A partial de-control procedure for developing an export confectionery groundnut trade and at the same time grading out seed stocks from approved stocks has been initiated.

Wheat

Certification procedures were also extended to wheat seed and eleven acres of foundation stocks were dealt with under the new scheme. Another 88 acres were inspected under the original approval scheme. The varieties Marodzi and Mazoe are particularly promising.

Miscellaneous Seed Crops

These embraced 710 acres of soybean, 61 acres of sunflower and substantial plantings of cowpeas, velvet and sugar beans, sunnhemp and sorghum. Results with sunflower were disappointing as 50 acres had to be rejected for seed purposes due to inadequate roguing and pollen contamination.

RESEARCH

Maize

The two field experiments to examine the effect of cultural practices, rotations and different fertility levels upon the incidence of ear rot diseases and stalk-borer attack were assessed for the third successive season at the Gatooma Research Station. The results confirm those previously noted in that adequate dressings of nitrogen reduce the incidence of *Diplodia zeae* but encourage stalk-borer. Trash properly incorporated in the soil had little effect upon the development of disease or of pest infestation. Continuous maize tended to encourage the incidence of *D. zeae* but had no obvious effect upon the incidence of stalk-borer in the ears. Fifteen seed dressings were tested on maize seed. Although it was not possible to analyze the results on a statistical basis the two T.M.T.D. (Thiram) formulations used were far superior to all other fungicides tested.

Groundnuts

In a replicated trial using eight seed dressings no significant differences in yields were obtained but a highly significant difference in plant count was shown by T.M.T.D./dieldrin over the control. This particular fungicide/insecticide formulation was better than any other dressing tested, including T.M.T.D. alone. Copper hydroxyquinolate was no more effective in this trial than various organo-mercurials and copper dithiocarbanmate.

Dormancy Studies on Grasses

Pretreatment of Sabi Panicum seed with concentrated sulphuric acid for 2-4 minutes gave the most consistent results. The occurrence of an inhibiting agent in the receptacles of *Cenchrus ciliaris* seed was established by presoaking techniques. Attempts are being made to identify the substance involved in conjunction with the Biochemistry Department at the University College. Work is also in progress on methods for germinating *C. ciliaris* seed with the receptacle still attached. A 0.5 per cent. solution of 20 vol hydrogen peroxide eliminates the effect of the inhibiting agent when germination proceeds in the absence of light with temperatures alternating between 20° and 30°C.

Bacteriophage

The use of appropriate phages for detecting various seed-borne bacterial pathogens offers a convenient method for dealing with suspect samples. Two specific bacteriophages for late blight *(Pseudomonas medicaginis* var. *phaseolicola)* and common blight *(Xanthomonas phaseoli)* of beans, kindly supplied by the Microbiology Research Institute, Department of Agriculture, Canada, have been used in preliminary studies on this problem. It has been found, however, that very few infections by both the common and late blights occur on beans which are not already contaminated with either the specific or non-specific phages. The presence of such bacterial viruses naturally affects plaque readings for the presence or absence of the bacterial phages. Studies are in progress with modified screening techniques and to develop methods for reducing the incidence of wild bacteriophages in test cultures.

Search is also being made for a specific bacteriophage for *Corynebacterium michiganense,* the cause of bacterial canker of tomato.

PUBLICATIONS

(1) "Bean Seed Production", by W. E. Kerr, *R.A.J.*, vol. 59, p. 159, May-June (1962).

(2) "Vegetable Seed Production in Tropical and Subtropical Countries", by W. E. Kerr, in Report of F.A.O. Technical Meeting on Seed Control, Production and Distribution (1962).

CHEMISTRY AND SOIL SCIENCE

GENERAL REVIEW

The year under review saw again a number of changes in the staff of the Chemistry Branch. Mr. D. P. Thornhill, a professional officer, left on resignation, and Mr. H. G. Thompson joined the Branch as pedologist on transfer from the Southern Rhodesia Division of Roads. Three Technical Assistants (Mr. J. Moerman, Mrs. G. A. Simon and Miss A. J. Meyer) resigned, and Mr. P. D. Johnson and Miss A. Buenk joined the staff in the same capacity. For practically the whole year two professional officers' posts remained vacant but the situation was alleviated by the employment of temporary technical assistants, including that of Mr. J. Barker, an experienced analyst. Of four newly created Branch III laboratory assistants' posts three had been filled by the end of the year.

The total number of samples analysed and reported upon during the year is given in Table I, together with the corresponding figures for the two previous years, but does not include samples analysed by the Research and Soil Survey Sections the work of which cannot be assessed in such terms. In spite of the disturbing effect of the staff shortages and changes, the total output of the Branch reached the high level attained in the preceding years. The number of soil samples analysed increased by 198 as compared with 1960/61, whilst samples analysed in the General Analytical Section showed a decrease of 567.

TABLE I

NUMBER OF SAMPLES ANALYSED

	1961/62	*1960/61*	*1959/60*
General Analytical Section . .	3,011	3,578	4,012
Soil Testing Section:			
Advisory	3,929	3,715	3,631
Investigatory	1,278	1,294	759
TOTAL	8,218	8,587	8,402

The apparent decrease in the output of the General Analytical Section is essentially due to the fact that a large proportion of routine analytical work is now being carried out at the research stations. Two technical officers are now seconded to research stations, i.e. one to the Grasslands and one to the Matopos Research Station, to do routine analytical work, leaving work of a more complicated nature to the Salisbury laboratory. It is intended to complete this decentralization by the secondment of a technical assistant to the Henderson Research Station in the coming year.

Of the 3,011 samples analysed by the General Analytical Section 2,781 samples (92 per cent.) were submitted by various Government departments. This included 1,480 samples (mainly plant materials, feeds and faeces) from various research stations, 731 samples (mainly toxicological specimens and blood samples) from the Veterinary Department, 92 samples (mainly waters) from the Southern Rhodesia Department of Native Agriculture, 60 miscellaneous samples from the Department of Conservation and Extension, and 35 water samples from the Hydrological Branch of the Southern Rhodesia Division of Irrigation and Lands. Samples of fertilizers, farm feeds and agricultural liming materials taken and analysed under the provisions of the Fertilizers, Farm Feeds, Seeds and Remedies Act numbered 143.

Considerable progress was made in the field of legislation. New fertilizer regulations were drafted and an amendment to the Agricultural Liming Materials Regulations was prepared.

Of the 5,207 soil samples analysed during the year in the Soil Testing Section 3,929 were advisory samples; 81 per cent. of the latter were from Southern Rhodesia, 18 per cent. from Northern Rhodesia, and only a small number from Nyasaland and foreign countries. As in previous years, tobacco and maize were the main crops for which fertilizer recommendations based on soil analysis were required, and the proportions of samples for these two crops were practically the same as for the preceding year, flue-cured tobacco lands accounting for 40 per cent. and maize lands for 29 per cent. of all advisory samples. The number of soil samples analysed for investigatory purposes likewise remained practically constant over the past two years.

The Soil Survey Section was during the year engaged on nine different surveys of short duration. For the first time the Section was called upon to carry out a survey outside the Federation, namely that of an irrigation project of 8,000 acres at Gaberones in Bechuanaland for the Department of Agriculture of the Protectorate. For the second time a survey was done on an existing irrigation scheme, namely part of Triangle Sugar Estate, with a view to improving the efficiency of irrigation. Other work by the Section included investigations in the field of clay mineralogy and reserves of weatherable minerals, technical improvements on an infiltrometer apparatus, and an examination of the quality of the water of certain rivers in the south-eastern lowveld of Southern Rhodesia.

Collaboration with the Department of Conservation and Extension in their farm-planning work has been continued. At the invitation of the South African Government, Mr. J. G. Thompson, Senior Officer-in-Charge, Soil Survey Section, together with senior officers of the Planning and Training Section of the Department of Conservation and Extension, visited South Africa. They attended a symposium on farm-planning techniques at Pretoria, at which they described the techniques developed and applied in Southern and Northern Rhodesia. Subsequently they went on a tour examining soils in the western Transvaal and the north-western Free State.

Collaboration has also been continued with the Inter-African Pedological Service to whom a number of soil descriptions were sent in addition to the previously forwarded map of Southern Rhodesia for use in the proposed soils map of Africa.

Steady progress has been made during the year in the Research Section. All the accumulated data from fertilizer experiments on which soil analyses had been carried out were examined, and the criteria on which fertilizer recommendations are based were re-examined and revised. Most of the correlations were for maize and tobacco but some useful information concerning fertilizer response was obtained for other crops. Further work was done on the effect of green manure, and a pot experiment in which phosphate labelled with radioactive phosphorus was used was conducted. However, against expectation, the results failed to indicate any effect of green manure on phosphate uptake.

Studies on the organic matter status and the structural characteristics of sandveld soils under different systems of rotation were initiated, using a newly-developed technique whereby organic matter is separated into three fractions according to its fineness. Results so far obtained indicate that different management practices have a relatively small effect on the level of fine organic matter—the humus fraction—and that the application of compost and the use of leys apparently influences the mineral status of the soil more than its organic matter content.

To obtain information on the use and action of lime the Section has co-operated with research stations and the Department of Conservation and Extension in various liming trials, and the rate of reaction of lime and soil has been studied in laboratory experiments and in the field. Thorough mixing such as by discing-in, and an adequate moisture status of the soil were found to be important factors controlling the effectiveness of lime applications.

The Soil Physicist has been engaged on a number of projects, such as a survey of the physical properties of soils at the various agricultural research stations, a study of the structural characteristics of sandveld soils, investigations on the changes in soil moisture status during the growth of various crops, and on the effect of the preceding crop on seasonal moisture carry-over. This work has been done in close co-operation with workers at the various research stations, the Department of Conservation and Extension, the Tobacco Research Board, and others. Considerable progress has been made in the construction of suitable equipment for these studies.

The Soil Physicist also visited Nyasaland to establish liaison with the soil physics work done at Lilongwe. He also visited Chirundu and Triangle Sugar Estates, and assisted in the establishment of an experimental unit at the latter estate in collaboration with the Sabi Valley Experiment Station.

Investigatory work in the spectrographic laboratory has been focussed mainly on the effect of fertilizers and soil amendments on the mineral composition of crop plants, and a scientific paper on the effect of nitrogen, phosphate, potash and green manure treatments on the mineral composition of maize has been prepared for publication. Advisory spectrographic work included diagnosis of zinc deficiency in maize, copper deficiency in certain orchards, anlaysis of Kariba weed *(Salvinia auriculata)* and work for other departments, in particular the Criminal Investigation Department.

Dr. D. H. Saunder, Senior Agricultural Chemist, and Officer-in-Charge of the Research Section, made a trip to Kenya, visiting the East African Forestry and Agriculture Research Organization, the Scott Laboratories the Coffee Research Station at Ruiru and the Catchment Experiments at Kimakia. While in East Africa, he attended two specialist meetings—one on applied meteorological research and one on soil science—and to the latter meeting presented a paper on "green manures, grass leys and nitrogen".

Dr. P. M. Grant visited South Africa to study recent work on clay characteristics, soil organic matter, and greenhouse design. Her visit included Natal University, the Agricultural Research Station at Potchefstroom, and the Division of Chemical Services and the Horticultural Research Station at Pretoria.

The Chief Agricultural Chemist and senior members of the staff have again served on a number of committees. Visits to research stations were paid by various members of the staff, and lectures were given to students of Gwebi Agricultural College, to officers of the Department of Conservation and Extension, the Southern Rhodesia Department of Native Agriculture and the Police, and to fertilizer agronomists. A number of scientific papers and popular articles have been published or prepared for publication during the year by members of the staff, and are listed at the end of this report.

During the latter part of the year negotiations were initiated between the Ministry and the Agricultural Research Council, for the secondment of Dr. D. H. Saunder and Dr. P. M. Grant to the soil fertility research team to be established by the Council at Grasslands Research Station. In this connexion both spent a good deal of time assisting in the design and equipping of the new laboratories.

Thanks are due to all members of the staff for their loyal co-operation and devotion to duty under frequently trying circumstances. Detailed reports of the individual sections follow.

GENERAL ANALYTICAL SECTION

Some progress has been made in new fields. A start has been made with investigations into the vitamin reserves of beef cattle. This year the work was purely of an exploratory nature and the facts arrived at will be used to establish a soundly based experiment next year. So far, 15 liver samples have been analysed for vitamin A content from cattle used in feeding trials at the Henderson Research Station. At the same station new methods of determining nitrogenous fractions and volatile fatty acids, for use in rumen research, have been established as the result of advice given by the Officer-in-Charge of the Section. The basic information for both lines of investigation was previously obtained by this officer at a study course undertaken in the U.S.A.

Towards the end of the year a bomb calorimeter was put into operation which it is intended to use to an increasing extent in the future to evaluate the results of feeding experiments in terms of calories.

The position of laboratory services on the research stations is proceeding very satisfactorily along the lines envisaged last year. The year has seen the laboratory at the Matopos Research Station come into full operation and as a result of inspections at this centre and at the Grasslands Agricultural Research Station changes have been made to increase the efficiency of these laboratories.

The post of technical assistant at the Henderson Research Station has been approved and it is hoped to fill it with a technical assistant already on the staff of this Branch in the early part of 1963. All the three principal research stations will then have facilities for routine analysis.

The Section has continued to collaborate with the U.S. Atomic Energy Commission in submitting monthly fallout samples.

A break-down of the analytical work of the laboratory is given in Table II. In all 3,011 samples were analysed of which 2,781 were submitted by research stations and other Government departments, as shown below:—

Chemistry Branch (including official samples)	262
Other Specialist Branches	106
Departmental Research Stations (including Gwebi Agricultural College)	1,480
Veterinary Department	731
Department of Conservation and Extension	60
Hydrological Branch, S.R. Division of Irrigation and Lands	35
S.R. Department of Native Agriculture	92
Other Government Departments	23
Private Individuals and Companies	222
TOTAL	3,011

Some remarks concerning the principal categories follow.

Official Samples (taken in terms of the Fertilizers, Farm Feeds, Seeds and Remedies Act)

In the year 43 fertilizers, 95 stock-feeds and 5 liming materials were sampled and analysed. This volume of work compares closely with the 1960-61 figures.

No cases of major deficiency in the chemical composition of these materials were noted. However, labelling errors continue to be a minor source of trouble.

Fertilizers, Manures and Liming Materials

The number of samples of fertilizers and manures has remained at a low level, possibly due to the fact that the majority of users of fertilizers rely on the products of reputable firms. However, the interest in agricultural liming materials continues to grow as the problem of soil acidity throughout Southern and Northern Rhodesia is increasingly being appreciated; this is reflected in an increase of samples analysed from 21 in 1960/61 to 50 in this year.

Farm Feeds and Vegetable Products

The number of analyses under this heading decreased from 1,877 in 1960/61 to 1,067 in 1961/62. As mentioned above this decrease was associated with the establishment of the laboratory at the Matopos Research Station. Even so, 75 per cent. of these analyses were undertaken for research centres: 150 samples came from Gwebi Agricultural College, 121 from the Grasslands Agricultural Research Station, 107 from the Salisbury Experiment Station, 188 from the Henderson Research Station, 117 from the Matopos Research Station and 84 from the Eastern Highlands Research Station.

TABLE II

SAMPLES ANALYSED IN THE GENERAL ANALYTICAL LABORATORY

	1961/62	*1960/61*
Fertilizers, Manures and Liming Materials		
Inorganic fertilizers	11	10
Organic fertilizers	10	12
Fertilizers (Under the Act)	43	42
Liming materials	50	21
Liming materials (Under the Act)	5	—
Miscellaneous fertilizers	1	3
Farm-feeds and Vegetable Products		
Farm-feeds	72	57
Farm-feeds (Under the Act)	95	114
Maize	31	31
Other cereals	25	
Legumes	22	421
Tobacco	—	2
Grasses and hays	452	859
Silages	18	
Other vegetable products	352	393
Animal Products		
Blood samples	185	247
Other animal products	37	54
Feeds and Faeces from Feeding Trials	539	455
Check Samples from Research Stations	119	—
Oils and Oil-seeds	213	4
Essential Oils	2	2
Waters	170	219
Toxicological Specimens		
Analyses for arsenic—positive	99	266
Analyses for arsenic—negative	355	268
Other poisons	65	48
Protection Products		
Arsenical dips	15	24
Organic dips	8	7
Other plant protection products	3	—
Miscellaneous	14	19
TOTALS	3,011	3,578

Twenty-four samples of maize (grain and stover) from a fertilizer experiment in the Hartley area were analysed for the Agricultural Mission of the International Potash Institute.

Animal Products

The lower number of blood samples analysed during the year fell into two main categories. Firstly, those analysed for Veterinary Department for diagnostic purposes, and secondly samples of blood, plasma and serum taken from game animals by the Tsetse and Trypanosomiasis Control Branch for the determination of their mineral content.

Apart from blood samples, analyses of liver for copper and cobalt and of ox-gall for total bile acids comprised the bulk of the remainder.

Feeds and Faeces from Feeding Trials

Analyses of these research samples continued at approximately the same level as for the previous year. Samples were submitted from three centres; 58 samples from Grasslands, 133 from Matopos and 358 from the Henderson Research Station.

Essential Oils

There is some interest in geranium oil production in this country, and with the new extraction plant this section is now in a position to collect 2-oz. samples of oil within a day. Further, all necessary analysis of the oil can be handled here.

Oils and Oilseeds

The 213 samples reported under this heading include 73 groundnut samples tested for the Seed Services Section for their moisture content, 35 groundnut samples analysed for a commercial firm for free fatty acids, 24 samples of sunflower seeds from various research stations, and 47 samples of soya bean varieties grown in the 1961/62 season at various research stations and farms in Southern Rhodesia. The latter samples were analysed for their oil, crude protein and fatty acid content at the request of the Ministry.

Waters

Work on the checking of the quality of the water from the Chibuwe borehole continued.

A series of 15 samples of water were submitted by the Soil Survey Section to check the quality of river waters in the Lundi catchment.

Toxicological Specimens

With the consolidation of a quantitative approach to this work only 99 positive cases of arsenic poisoning have arisen from 454 samples submitted. This is in contrast to our previous experience of about 50 per cent. incidence based on the semi-quantitative Marsh procedure.

There is no doubt as to the advantages gained from the quantitative approach in that veterinarians are now able to give, with a great degree of certainty, opinions based on concrete evidence.

During the year the Branch has also co-operated with the Veterinary Department and the Department of Conservation and Extension in an investigation on alleged arsenical contamination from old mine workings in the Umtali North I.C.A., involving a considerable number of tests on animal specimens and samples of water, herbage and rocks.

SOIL TESTING SECTION

The total number of samples received (5,426) showed an increase of 9 per cent., thus maintaining the rate of expansion reported last year.

On the advisory side, 1,343 reports were issued on 3,929 analyses. Soil analysis reports were also made on 1,278 samples submitted for the compilation of scientific data or for correlation with response data from critical field experiments.

Table III demonstrates the nature of the service provided, the range of crops covered, and the extent to which the service is used by different sections of the farming industry in the Federation. Table IV presents comparative data and includes figures for the previous year. The proportions in the various "crop categories" have remained remarkably constant, and again the greatest use of the service has been made by tobacco farmers, with maize farmers following fairly closely. The proportion from Northern Rhodesia has risen slightly, returning, in fact, to the figure for 1959/60, and the increase has been almost entirely in the samples for tobacco recommendations.

One notable change has been made in the methods of analysis.

TABLE III

SOIL SAMPLES UPON WHICH REPORTS WERE ISSUED

	Southern Rhodesia	*Northern Rhodesia*	*Nyasaland*	*Foreign*	*Total*
ADVISORY					
Tobacco: Flue-cured	1,191	352	—	32	1,575
Turkish	10	—	—	—	10
Other types	14	7	—	—	21
Seed-beds	33	2	—	—	35
Maize	905	245	—	—	1,150
Wheat	9	3	—	—	12
Potatoes	48	5	—	2	55
Other cash crops	77	12	—	14	103
Green-manure crops	17	3	—	—	20
Lucerne and fodder crops	72	14	—	—	86
Pastures	50	2	—	—	52
Market-garden crops	56	14	—	—	70
Fruit trees, vines, etc.	42	4	—	—	46
Sugar-cane	17	—	—	—	17
Tea and coffee	8	—	—	—	8
Other specialized crops	2	—	—	—	2
Native rotations	77	—	—	—	77
Conservation and Extension demonstrations, etc.	51	13	—	—	64
Private gardens	137	2	2	—	141
Sports clubs	43	3	—	—	46
Diagnosis and fertility assessment	112	10	—	—	122
pH tests and liming rates	184	22	—	2	208
Miscellaneous analyses	9	—	—	—	9
TOTALS	3,164	713	2	50	3,929
IVESTIGATORY*					
Chemistry Branch	208	—	—	—	208
Research and Specialist Services	772	—	—	—	772
Conservation and Extension	33	8	—	—	41
Other Government Departments	132	—	—	—	132
Statutory bodies	16	—	—	—	16
Other scientific organizations	109	—	—	—	109
TOTALS	1,270	8	—	—	1,278
GRAND TOTALS	4,434	721	2	50	5,207

* Includes only analyses for compilation of scientific data or for purposes of correlation with experimental data or field observations.

TABLE IV

ADVISORY SOIL SAMPLES REPORTED: COMPARATIVE DATA

This table shows according to territories and categories of work:

(*a*) The number of soil samples on which advisory reports were issued.
(*b*) This number as a percentage of the territorial total.
(*c*) This number as a percentage of the grand total from all sources.

	Year under review (1961/62)			*Previous year (1960/61)*		
	(*a*)	(*b*)	(*c*)	(*a*)	(*b*)	(*c*)
Southern Rhodesia						
Flue-cured tobacco . . .	1,191	38%		1,255	40%	
Maize	905	28%		853	27%	
Other crops	532	17%		475	15%	
Miscellaneous*	536	17%		572	18%	
TOTAL	3,164		81%	3,155		85%
Northern Rhodesia						
Flue-cured tobacco . . .	352	50%		212	39%	
Maize	245	34%		266	49%	
Other crops	66	9%		44	8%	
Miscellaneous*	50	7%		24	4%	
TOTAL	713		18%	546		15%
Nyasaland						
Flue-cured tobacco . . .	—			—		
Maize	—			—		
Other crops	—			2		
Miscellaneous*	2			—		
TOTAL	2		0·1%	2		0·1%
Foreign Countries						
Flue-cured tobacco . . .	32	64%		12		
Maize	—			—		
Other crops	16	32%		—		
Miscellaneous*	2	4%		—		
TOTAL	50		1%	12		0·3%
Totals from all sources						
Flue-cured tobacco . . .	1,575		40%	1,479		40%
Maize	1,150		29%	1,119		30%
Other crops	614		16%	521		14%
Miscellaneous*	590		15%	596		16%
GRAND TOTAL . .	3,929			3,715		

* "Miscellaneous" includes: private gardens and sports clubs; Conservation and Extension demonstrations, etc.; analyses for diagnostic purposes and for lime requirements only; analyses for non-agricultural purposes.

Extraction of available phosphorus with hot N/10 sodium hydroxide solution, which has been employed for the past seven or eight years, has been replaced by a method using an anion-exchange resin. Correlations made by the Research Section prior to its introduction indicated that data obtained by this method of extraction could be expected to reflect more accurately the availability of soil phosphorus over a wide range of soils, especially on lands that had received phosphatic fertilizer in the past. Experience so far obtained in using the new data for advisory purposes fully bears out these conclusions.

During the year all criteria used for assessing plant-nutrient status and crop requirements were critically examined and brought up to date in collaboration with the Research Section.

SOIL SURVEY SECTION

Soil Surveys

During the year the following soil surveys were carried out:

(1) An examination of the granite sandveld soils on the Henderson Research Station with a view to siting an experimental area typical of these soils in African areas. Unfortunately, no representative soils were found.

(2) A survey covering some 8,000 acres at Gaberones, for the Department of Agriculture, Bechuanaland Protectorate, in order to find soils suitable for irrigation. Only about 250 acres of alluvial soils flanking the Notwani River could be considered a practical proposition.

(3) A detailed pedological examination on the Atlantica Ecological Research Station near Salisbury.

(4) The Class C areas (original surveyed in 1953) on the crown-land areas of the Sabi East Bank alluvium were re-examined and re-assessed in

the light of more recent knowledge, and on the assumption that the flooding to which these areas are subject will be eliminated.

(5) A semi-detailed survey of the main Tuli Irrigation Project (Dibilishaba) covering about 60,000 acres was completed. No suitable (Class A) soils were found and the proportion of marginal (Class B) soils is small, consisting mainly of widely scattered heterogeneous pockets.

(6) A 45-acre irrigation block was selected on the Grasslands Research Station.

(7) The commandable soils (approximately 12,000 acres) of the Wengi project were investigated. A high proportion of the soils is irrigable and could be irrigated from a proposed dam on the Wengi River. About 12 farms are involved in this project.

(8) A very detailed survey was made of the 3,700 acre block comprising the main area under spray irrigation on Triangle Sugar Estates in order to delineate all practical soil variations and associated differences in available water capacity. On the basis of this information the company intends improving the efficiency with which irrigation water is used.

(9) An area comprising about 70,000 acres on the west bank of the Mtilekwe River below Esquilingwe Weir was surveyed for irrigable potential.

Special Investigations

Fundamental data on Southern Rhodesian soils, including base saturation, clay mineralogy, and reserves of weatherable minerals are being accumulated with a view to producing a revised soil map of Southern Rhodesia. Such data are acquired both in the course of routine surveys and on occasional visits to areas where no soil examinations have been carried out.

Other work of an investigatory nature included the examination of the quality of the waters of the major rivers in the south-eastern lowveld of Southern Rhodesia and their suitability for irrigation.

Laboratory Work

A total of 271 soil samples were analysed during the year. A large proportion of analytical work carried out was connected with some of the special investigations mentioned above.

RESEARCH SECTION

Fertilizer Responses and Soil Analysis

During the year all the accumulated data on fertilizer responses, on soils for which analytical data were available, were examined. The criteria on which fertilizer recommendations are based were re-examined and revised and were brought into effect in the soil testing section.

Tobacco and Maize

Most of the available data were for tobacco and maize, for which correlations between soil levels and responses to nitrogen, phosphorus and potassium were worked out.

Phosphorus.—As anticipated, the resin-extractable soil phosphorus was found to correlate better with crop responses than the alkali-soluble fraction. Also, with the sodium hydroxide procedure somewhat different results are obtained on soils of different texture, whilst the resin procedure does not appear to be influenced by soil texture. This, together with its theoretical advantages, suggests that the resin-extraction procedure is less empirical and gives a truer reflection of the available fraction of soil phosphorus.

Nitrogen.—As had been found before with more limited data the best correlation between crop response and soil data was given by the mineral nitrogen found after incubation. Satisfactory correlations were obtained particularly for maize. Both the initial nitrogen and the nitrogen mineralized during incubation gave poorer fits with crop responses, whilst the total nitrogen was unrelated to response, except within a given soil type.

In the case of tobacco on early ploughed lands, a much poorer overall correlation was obtained between the mineral nitrogen after incubation and percentage responses in the field and the "optimum" rate of nitrogen required, taking account of quality. Clearly, in recommending for tobacco as much account must be taken of land history, cultural practices, date of planting, etc., as of the mineral soil nitrogen itself. On late-ploughed tobacco lands, no significant correlation was found between mineral nitrogen and crop responses in the field, and it seems that some other factor, perhaps moisture status, affects crop responses to nitrogen on recently ploughed lands.

Potassium.—In the case of maize, it was found that responses to potassium were dependent on the degree of saturation of the base exchange complex with respect to potassium.

In the case of tobacco grown on sandy soils, so few and such small yield responses have been obtained to potassium that it is not possible to correlate them with the soil data. Until the benefits or otherwise of potassium on leaf quality can be accurately assessed there appears to be no reliable way of predicting the potassium requirements of tobacco.

Other Crops

Sufficient data are still not available to enable correlations between responses or optimum fertilizer dressings to be calculated for most alternate crops with any validity. The available data for each crop were, however, examined to see whether the threshhold values and responses differed widely from those of maize. An assessment was made of the most profitable fertilizer levels to apply to soils characterized by different levels of available nutrients, and some useful indications have been obtained for potatoes, cotton, groundnuts, kenaf, castor beans, lucerne, and irrigated pastures.

GREEN MANURING

Further work was carried out to ascertain the reason fo the benefit from turning under the green manure in the trial at the Salisbury Agricultural Experiment Station.

In order to test the effect on phosphate availability, surface soil samples were taken from where the legume had been turned in and where it had been removed, from both phosphate-treated and untreated plots. These soils were test-cropped in the greenhouse with millet, using three levels of applied phosphate labelled with radioactive phosphorus. The radio-chemical assays were kindly carried out by Dr. Jenkins of the University College of Rhodesia and Nyasaland.

Although there was a marked response to phosphorus on the phosphate-deficient plots, the green manure did not affect the uptake of phosphorus from the soil or from the fertilizer. This is in contrast to field results where green manure had been shown to increase the phosphate uptake of the maize and where the grain yields show an interaction between green manure and phosphate.

MINOR ELEMENT SURVEY

Following the completion of the analysis of soil and plant samples taken for this survey some years ago, a report summarizing the results has been prepared for publication.

SOIL CHEMISTRY

Organic Matter

The organic matter content of soils under various cropping systems was determined in samples from a number of sites in granite sandveld, varying from rich soils under ley systems to worked-out native fields. For this study a technique was developed whereby organic matter is separated into three fractions according to its fineness.

In all the soils examined the greatest differences between rotations lay in the coarse, undecomposed organic matter, and well-fertilized row crops maintained as high a level of fine organic matter ("humus") as did the grass rotations. Low mineral fertility was associated with a greatly reduced content of both undecomposed residues and fine organic matter, and the use of kraal compost or of a ley rotation had a greater effect on the mineral status of the soil than on its organic matter content.

This work is being continued and samples have recently been taken from different rotations at the Salisbury Agricultural Experiment Station and are being analysed in order to determine the distribution of organic matter in a typical red clay.

Liming

As our knowledge concerning the local use of lime is still incomplete, field and laboratory studies on liming were undertaken to collect the background information necessary for advising farmers.

In co-operation with other departments three field trials on methods of incorporating lime into the soil were laid down. Two were successfully completed—one being on a cloddy clay-loam at the Henderson Research Station and one on a fine-grained sand at the Copperbelt Experiment Farm. At both sites the increase in pH of the top-soil in the first season after liming was nearly twice as great when the lime was disced-in as when it was incorporated by ploughing. In all cases the immediate response of maize to liming was small, but on the Copperbelt Farm the response to lime was limited by a trace element deficiency which will be investigated further.

The rate of reaction of lime and soil has been studied in small-scale laboratory tests. When thoroughly mixed into the soil, the lime reacted rapidly, so that the greatest reduction in acidity took place in the first four days followed by a slow but steady reduction over the next two months. The pH reached depended on the moisture content of the soil, and the full effect of lime was only attained when the soil had been raised to field capacity for a short period.

SPECTROCHEMISTRY

Several series of plant samples from fertilizer trials have been analysed, including maize, lucerne, *Crotalaria* and tobacco, to determine the effect of fertilizer and soil amendments on plant mineral composition.

The application of nitrogenous fertilizers, phosphates, potash and green manure produced significant changes in the mineral composition of leaves and stover of maize. The detailed results of this investigation will be reported in a scientific paper which is to be published shortly.

In lucerne, fertilizers affected the trace element content rather irregularly. The effect of fertilizer treatment on *Crotalaria* was almost entirely a "dilution" effect. The mineral levels generally decreased with increased yield, except that phosphates markedly increased the sodium uptake which was very large compared to that of maize.

For tobacco, the most striking effect was the raising of manganese levels by nitrogen applications. Phosphate fertilization also increased the manganese content, though to a lesser extent, but slightly decreased the iron and aluminium levels.

Generally, it seems that the effect of fertilizer treatment on mineral composiion is much more apparent in young, growing plants than in mature plants.

Advisory Work

A considerable amount of advisory work was carried out, which included the diagnosis of zinc deficiency in maize in the Lusaka district and near Hartley. Copper deficiency was found in several citrus orchards and was usually associated with low zinc levels.

A number of samples were analysed for other departments such as the Veterinary Department and the Criminal Investigation Department. Also, samples of *Salvinia auriculata* and various other materials were dealt with.

SOIL PHYSICS

A survey of the physical properties of soils at research stations throughout Southern Rhodesia has been commenced. Particular attention has been given to the structural characteristics of sandveld soils using undisturbed core samples. Cropping history appeared to have little effect on soil structure at Msengezi and in the Zimutu Reserve but at the Kutsaga Research Station soil after a 4-year ley showed a significantly lower bulk density and increased macro-porosity in the ridge of the following tobacco crop than soil which had been continuously cropped. Heavy grazing of a ley at Grasslands caused a marked increase in the bulk density of the top-soil before ploughing. How important these differences are in local crop production is unknown at the present time.

Studies on changes in soil moisture status during crop growth were made at several sites. At Inyanga gypsum blocks indicated that the only period of appreciable water stress under mature apples was from mid-October to early November. Water content and retention determinations were undertaken on samples obtained from irrigated and unirrigated tobacco lands at Enkeldoorn, and periods of considerable water stress were shown to occur in the unirrigated fields. Direct measurement of water content changes were made at the Salisbury Agricultural Experiment Station during and at the end of the growing season. Considerable quantities of available water remained after wheat, soya beans, potatoes and burley tobacco, whereas no available water remained after sunflowers. Heavily fertilized maize on the Evapotranspiration Project at the Henderson Research Station showed a residual soil water deficit of eleven inches to a depth of five feet compared with eight inches for unfertilized maize.

At the Salisbury Agricultural Experiment Station marked and abrupt increase of bulk density and wilting precentage occurred in the soil at plough depth. Structure studies were also made on vlei soils at the request of the Drainage Engineer.

A considerable amount of time has been given to the development of certain basic items of equipment including a sand-bed tension table, an air pycnometer and an AC ohmmeter for use with both nylon and gypsum blocks.

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ENTOMOLOGY

INTRODUCTION

The favourable staff position which obtained in the Entomological Branch at the beginning of the year was not maintained since Mr. J. Goldsmid resigned early in 1962 and it was not possible to fill the vacancy so caused until near the end of the year when Mr. C. Hodgson joined the staff. A new post specifically to serve Northern Rhodesia was created and this also was filled at the end of the year by Miss M. E. Richardson. All posts are now filled and the Branch is stronger than ever previously in its history, with seven entomologists and a helminthologist. Mr. Whellan has remained in charge of all phytosanitary matters, the control of pink bollworm and biological control of lantana; Mr. Rose has worked on the above-ground pests of maize with especial reference to the vectors of maize streak; Mr. Wilson has worked on the underground pests of maize, especially maize rootworm in Northern Rhodesia and maize snout beetle in Southern Rhodesia and Mr. Carnegie has worked on the pests of deciduous fruits and vegetables. All these officers dealt with general and advisory matters as they arose, as also did Mr. Martin in his special field of helminthology. Mr. Farrell was seconded to the Grain Marketing Board and dealt with the control of stored products pests, especially the moths, *Cadra cautella* and *Plodia interpunctella* which have become of relatively greater significance now that a good measure of control of most beetles has been achieved.

The Chief Entomologist presided at the fourteenth session of the Council of the International Red Locust Control Service which was held at the headquarters of the Service in Abercorn in June. A large measure of agreement on the form of the new Convention was secured at this meeting. It is to this Branch a matter for regret that, on financial grounds, the Federation's support for the International African Migratory Locust Organization was withdrawn. The annual meeting of the Inter-African Phytosanitary Commission was held at Ibadan in October and was attended by the Chief Botanist and Plant Pathologist. At this meeting Mr. Whellan was elected chairman of the Commission for the ensuing year. The Chief Entomologist or his deputy attended meetings of the Trypanosomiasis Committee, the Rhodesia Seed Potato Association, the Rhodesian Nurseryman's Association, the National Publications Trust, the Pesticides Sub-committee of the Rhodesian Standards Association and the Fumigation Sub-committee of the South-Western Tobacco Marketing Board. As a result of the work of this last sub-committee arrangements for the provision of vacuum fumigation facilities at Beira were completed.

The Branch is indebted to the National Museum in Bulawayo for the close co-operation which it gave during the year and for its invaluable help in insect identification and library loans.

INVESTIGATION AND RESEARCH

Pink Bollworm (Platyedra gossypiella)

A number of surveys of the Sabi Valley and adjacent regions was made for this insect and its main alternative host plant, *Hibiscus dongolensis.* On the Sabi Tanganda Estate, following the discontinuance of cotton growing, heavy growths of *H. dongolensis* were found in old cotton fields, and in one of these a very heavy concentration of pink bollworm was found. Steps were taken to destroy these plants before the bollworms matured. Very few pink bollworms were found elsewhere in the Sabi Valley. A short survey was made to the west of the Sabi River in the Ndanga District, extending as far as Hippo Valley. In this area *H. dongolensis* was found in only two localities in both of which it was in small quantity and did not harbour any pink bollworm. In view of the generally low incidence of pink bollworm, removal of cotton from the Sabi Valley is now permitted without fumigation if, on the property on which the cotton is grown, steps have been taken to destroy *H. dongolensis* and no pink bollworm can be found.

FRUIT INSECTS

Fruit-fly (principally *Pterandrus rosa* Ksh).—Following on last year's trials using different baits and cover sprays, further trials were carried out on the same Cashel farm as before using a soluble fish extract bait and the new insecticide "Lebaycid" (0, 0-dimethyl- = -4-(methyl-mercapto)-3 methyl phenyl thiophosphate). The low incidence of damaged fruit from trees treated with Lebaycid was remarkable (8.4 per cent.). Untreated fruit reaped from the same orchard last year was 94.2 per cent. infested. Baiting with fish extract under similar conditions did not overcome heavy losses from fruit-fly (72.7 per cent.). It was found in the laboratory that sugar-baited traps attracted most fruit flies, but that in the field fish-extract baits were more successful in traps, presumably because the stronger scent is attractive over greater distances. The fruit-fly *Pterandrus cosyra* (Walk.), which closely resembles the Natal fruit fly *Pterandrus rosa* Ksh., was reared in considerable numbers again this season from fruits of màrula *(Sclerocarya caffra),* but it has not been reared from cultivated fruits.

Woolly Apple Aphis (*Eriosoma lanigerum*).—Further trials in which a systemic insecticide (methyl-demeton) was injected into stems by way of a spiral of small holes near the base of the trunk showed that 100 per cent. control could generally be achieved, but a quick method of application needs to be found. Small-scale trials, against subterranean woolly aphis colonies in which two diluted chemicals were poured on ground beneath trees showed that VC-13 (0-2, 4-dichlorophenyl 0, 0-diethyl phosphoro-thioate) gave good control, but that DBCP (1, 2-dibromo-3-chloropropane) did not. The population of the introduced wasp parasite, *Aphelinus mali,* built up very satisfactorily at Rhodes Inyanga Orchards, where it was originally released. It has brought about a state of control which it is hoped will be permanent, and from Rhodes Inyanga Orchards it has now been introduced and become established in the Odzani and Melsetter areas. In the new areas it is showing promise of good control where spraying operations have not inhibited its activities. A colony of woolly aphis was discovered in a Salisbury suburb and *Aphelinus mali* was released here also.

Fruit-piercing Moths.—These caused considerable damage in some areas but were troublesome for only a very short period. Adult specimens caught at night in vineyards near Umtali were placed in the insectary and presented with fruits of various sorts and in various stages of ripeness, but none fed under these conditions and no further useful information was gained.

Bean Stem Maggot (*Melanagromyza phaseoli*)

Further trials designed to compare the value of different insecticidal seed dressings for control of bean stem maggot were carried out at Henderson Research Station and at the Salisbury Agricultural Experiment Station. These were carried out in conjunction with officers on these stations. Previous trials at Henderson Research station have indicated that dieldrin may slightly depress yields when compared with endrin, when both treatments are applied as emulsion concentrates. Further evidence supporting this was obtained. Telodrin was shown to be equally as effective as endrin in controlling bean stem maggot applied to the seed as a concentrate 15.8 per cent. emulsion at the rate of one fluid ounce to five pounds of seed. Mixing seed before planting with aldrin 40 per cent. wettable powder dry gave some control of bean stem maggot but was not as effective as slurry or emlusion treatments of seed.

Maize Streak

Four insect vectors of streak disease of maize have been found in Rhodesia and the three most abundant species have been identified as *Cicadulina storeyi, C. mbila* var. nov., and *C. parazeae.* A fourth species of *Cicadulina* used successfully in transmission tests was collected in one locality but has not been found since. Further specimens are needed before this can be described.

Studies of the bionomics of the different species are being made. The purchase of a back pack motor fan for sampling insect populations as described by E. J. Dietrick (1961) has facilitated quantitative sampling of habitats.

Investigation of measures for prevention of streak disease through control of insect vectors was started. As maize plants are most susceptible to streak during the first few weeks after germination various insecticidal seed dressings have been tested. Extensive pot trials demonstrated that disyston in the formulation available was the most promising. Insect vectors caged on seedlings grown from seed treated with disyston 50 per cent. impregnated charcoal were killed within 24 hours in repeated tests until 35 days after germination of the seeds. After that period the systemic effect was quickly lost. Infected insects transmitted the disease to the seedlings before being killed. The seed dressings were tested in replicated field trials at Chipinga and Enterprise. Regular sampling for insect vectors confirmed that populations in the plots in which seed had been treated with disyston were significantly lower for more than 30 days than populations in the control plots. The incidence of streak in both experiments was too low for conclusions to be reached on the disease aspect.

Potato Tuber Moth (Gnorimoschema operculella)

Less attention could be given to investigations of this important pest of potatoes and only one insecticide field trial was made in the Enterprise area. This was a replicated trial comparing 12 different insecticides with a control. All insecticides were applied as sprays at the rate of 13 gallons per acre at fortnightly intervals commencing when plants were 10 inches high. The trial was made in co-operation with a commercial pest control firm. Results were assessed by counts of stem damage due to borers in tips and axils of branches and also by counts of miners in leaves.

Insecticides endrin, sevin, DDT, malathion, rogor, thuricide, heptachlor, dieldrin, NC 930 and NC 1110 all gave control at $P > 0.05$ level. Sprays with diazinon at ½ lb. active ingredient per acre and with NC 1110 at 16 fluid ounces per acre gave no control. Best control of stem boring was obtained with endrin at 0.25 lb., malathion at 1.25 lb., rogor at 6.4 fluid ounces, DDT at 1½ lb., and dieldrin at 0.75 lb. active ingredient per acre. Leaf mining was most effectively prevented with sprays with sevin at 1 lb. active ingredient per acre and by malathion, DDT, dieldrin and endrin at the rates given above.

In this trial no evidence of DDT tolerance was found.

Maize Root-worm (*Buphonella murina Gerst.*)

Maize root-worm was a particularly severe pest of maize this year in a large area of Northern Rhodesia and the recognized limits of distribution have been extended southwards to the Livingstone I.C.A. and north to the Mkushi Block.

In Southern Rhodesia maize root-worm was found in two localities near Salisbury and at Eagle's Nest near Umtali but these infestations were not of agricultural importance.

Investigations carried out at Salisbury with Northern Rhodesian material confirmed the suspicion that the eggs of *Buphonella murina* rest in the soil during the dry season and hatch with the onset of the rains to infect young maize and developing indigenous grasses.

Collection of adults from infested maize lands having lush growths of rapoko grass, *Eleusine indica,* was carried out at Kanchomba Institute of Agriculture, near Mazabuka. The beetle population reached a maximum in the first weeks of April after which it gradually declined, becoming zero in June. As the season progressed the low incidence of parasitism by a Tachinid recorded at the beginning of the season increased to over 50 per cent. by the end of the season.

Field scale and critical small plot trials indicated that the insecticides capable of controlling maize root-worm economically are aldrin, dieldrin, heptachlor and telodrin.

For farmers who hand-plant maize two methods of application are available. Either conventional seed dressings with heptachlor at the rate of 1 ounce of 40 per cent. wettable powder per 5 lb. of seed or dusting the planted seed with a soil insecticide before the seed is covered with soil are effective.

Farmers who plant by machine can also be offered a choice of two methods of application. The widely used aldrin fertilizer mixture can be used by farmers with older-model planters, which can be adapted to place the mixture ½ in. above the seed at planting. With the newer-model planters granular insecticide applicators delivering granular heptachlor at planting is the most efficient available method of maize root-worm control.

Research is being undertaken into the application of insecticide in sprays at planting or broadcast before planting.

Maize Snout Beetle (Systates exaptus Mshl.)

The larva of the snout beetle was implicated in attacks on seedling maize over quite a large area of Southern Rhodesia. The most notable outbreak was at Sigaro Farm near Salisbury, where the larvae and later the adults did extensive damage to seedling maize.

The larva grazes on the epicotyl of young maize and thus reduces the conducting link between the root and shoot and causes stunting of the plant. The affected plants remain stunted throughout the growing season and fail to produce cobs.

Although a large number of mature beetles were caged with young maize and rapoko grass *(Eleusine* sp.) the stimulus for egg laying appeared to be lacking and none were obtained.

From early April larvae of all sizes have been found in the soil of maize fields which have had dense growths of rapoko grass. Samples of soil have been examined, sieved and the larvae collected, measured and dissected. Larvae caught in September appear to have the same size range as those caught in April and it therefore appears that larvae in whatever stage they happen to be rest during that winter. The gut of all larvae appears to contain fluid contents but staining techniques have failed to reveal any plant material. At this time the soil is so hard and dry that it would seem to be beyond the powers of the larvae to move about in it and so to obtain food.

Critical trials are planned for Gwebi Agricultural College and Sigaro Farm in the coming season to assess the efficacy of various insecticides and methods of application.

Rice Borer

Adults of rice-boring caterpillars were collected from infected stems of rice at Kafue and were reared both at Salisbury and Kafue. The moths were both regarded by the Commonwealth Institute of Entomology as belonging to a new genus of Crambidae.

Two diptera were also reared at Salisbury from larvae collected at Kafue and were identified by the Commonwealth Institute of Entomology as *Diopsis thoracica* and *Pachylopus* sp. (a Chloropid).

It seems, therefore, that the borer problem is a complex of Crambid lepidoptera and dipterous larvae.

Endrin sprays at 0.5 lb. of active ingredient per acre increased the yield of the treated plots by 50 per cent. over untreated plots. Thus, although the rice-borer caterpillar is not always a limiting factor some other insect pests that are controlled by endrin, possibly dipterous stalk borers, do cause appreciable damage and loss in yield and may act as limiting factors.

San José Scale (Quadraspidiotus perniciousus)

This scale was recorded for the first time in the Federation when found in a Marlborough garden, Salisbury, during July. A survey was done immediately which showed that it was present in at least three other Salisbury suburbs and also in the Eastern Districts—Juliasdale and Melsetter. It appears to have been established for some time and will probably prove to be even more widespread in Southern Rhodesia and possibly farther north. It has, incidentally, been recorded in Katanga. It is considered to have been imported from South Africa where it has been established since the beginning of the century. Because it has probably been overlooked in the past, and may be quite widespread, an eradication programme has not been attempted.

Castor-bean Pests

Insect pests can severely reduce yields of castor-bean crops and some investigations were started on their control and status. Empirical insecticide trials were carried out at Salisbury and Henderson Research Station. At each centre unsprayed areas were compared with areas in which plants were "blanket" sprayed to eliminate pests. This was achieved with weekly sprays containing $1\frac{1}{2}$ lb. technical DDT in 20 gallons of water per acre commencing with the first sprays as candles formed, and continuing until harvest.

At Henderson Research Station the unsprayed plants were severely affected by insect pests, notably by various Mirid bugs, *Eurystylus capensis, E. kikuensis, E. immaculatus, Taylorolygus pallidulus* and *T. ricini*. Adults and nymphs of these bugs attacked the developing candles causing abortion and drop of developing fruits. Yields obtained from sprayed and unsprayed plots were 174 lb. and 0.6 lb. respectively. Virtually no fruits were obtained in the unsprayed plots.

The trial at Salisbury escaped attack from insect pests. Mirid bugs were only occasionally found in the unsprayed plots. This was reflected in the yields in which there were no appreciable differences between sprayed (66.7 lb.) and unsprayed (66.4 lb.).

During the season records of the different insects occurring on castor-bean crops were considerably extended.

Insects Associated with Lantana camara and its Biological Control

It has now been confirmed that the flies bred from lantana berries are *Ophiomyia lantanae* and not *Ophiomyia rhodesiensis* as previously reported. In the past year infested berries were collected near Umtali, Mount Selinda and Bulawayo as well as at Salisbury where they were found originally. One of the Umtali localities was in the hot Burma Valley whereas the Mount Selinda locality is cool so that the fly clearly can tolerate a wide climatic range. In all localities it was plentiful and is evidently not of recent introduction so that it may be presumed to have formed a stable relationship with its host and therefore to be of no value for biological control. The moth *Hypena strigatus* has again been reared from larvae collected at Salisbury. This insect has some value for control in other parts of the world, but holds no promise here. The culture of *Teleonemia scrupulosa* being built up at Salisbury did well during the rainy season and liberations on a small scale were made at Penhalonga, Umtali and Mount Selinda. Unfortunately, the time chosen for making these releases coincided with the worst cyclone of the season in the Eastern Districts. Subsequent investigation showed that none of the releases had been successful which may well have been due to the adverse weather conditions. Other releases were made near Lusaka and Chisamba but there has been no opportunity to examine these. The culture at Salisbury declined very seriously during the dry season so that the prospects of success with this insect seem poor although all hope has not yet been abandoned, particularly in warmer localities. A weevil larva which lives inside the stem of *L. camara* was collected at Umtali and an attempt to breed it is being made. Constant liaison is being maintained with the Natal Region of the Department of Agricultural Technical Services in regard to biological control of lantana. Except for some success with *Teleonemia scrupulosa* in the Durban area, where climatic conditions are probably more favourable for it than anywhere in Rhodesia, and despite having tried more insects than this Branch has done, they seem to have had no more success.

Salvinia auriculata

In view of the possibility of using insects for the biological control of *Salvinia auriculata* at Kariba, the Chief Entomologist has now been co-opted to the Salvinia Sub-Committee of the Kariba Lake Co-ordinating Committee. There has not yet been any opportunity for active work on this problem.

Caddis Flies

A report was received of caddis fly larvae occurring in vast numbers and thereby impeding water flow in the irrigation canal leading from the Esquilingwe Weir to the Triangle Estates. This was investigated and found to involve mainly the species *Amphipsyche senegalensis* (Brauer) belonging to the family Hydropsychidae. Unlike the majority of better-known caddis flies, the larvae of this species, having constructed a case of particles of silica, attach themselves firmly to rocks or other fixed objects, in this case the walls of the canal, and allow the flowing water to bring their animal food to them. This is caught by silken nets or sieves which the larvae spin. The larvae were found to be particularly numerous in the first section of the canal and on the downstream side of the U-shaped siphons which carry the canal across valleys. Their abundance in these localities seemed to be associated with the turbulence of the water. Their presence increases the friction on the sides of the canal thereby reducing its effective size substantially. When the water in the canal is shut off the larvae leave their cases and scramble down the walls. By making use of this habit, and cleaning the walls on these occasions it may be possible to secure a sufficient degree of control. Alternatively the addition of insecticides to the canal water might prove effective, but this has not so far been tried.

Stored Products Pests

Insecticide Experiments.—In the laboratory the penetration of insecticide treated sacking by first instar larvae of *Cadra cautella* has been studied. Deposits of sevin, malathion, lindane and diazinon at 25 and 50 mgm. per square foot were tested over a period of three months. Diazinon was most effective (nil survival), followed by lindane and malathion, while sevin had poor effect. Similar results were obtained from treated bags in a cage infested with *C. cautella* over a period of seven months (no diazinon treatment). Pre-treatment of sacking with size, followed by treatments with malathion and lindane had no effect on the persistence of the insecticides over a 2½-month period. This may be due to the non-alkaline nature of the sacking. DDVP ("Nuvan") has been found, two months after application, to inhibit hatching of *C. cautella* eggs placed on treated sacking. Six experimental 500-bag maize stacks have been constructed to be sprayed with lindane, diazinon, malathion-lindane mixture and "polykil" (a viscous material). Thermocouples have been laid in the stacks and grain samples can be taken from all depths. A survey of maize stacks treated (at each layer) with 0.5 per cent. lindane dust was carried out. The average number of *C. cautella* pupae per bag was estimated for each stack. Lindane treatment was found to reduce pupal numbers by at least 50 per cent.

Biology.—Some work was carried out on the egg period and instar duration of *C. cautella.* A survey of Bruchid infestation of stored beans from native areas was made.

Equipment.—A constant temperature cabinet and a machine for spraying experimental sacking were constructed for laboratory use. For possible field use, a vertical spray boom giving uniform application to the sides of grain stacks up to 20 ft. high was developed. A system for the injection of insecticidal dust into grain bags using multiple probes is giving encouraging results.

Visits.—During the year eight visits were made to Beira and one to Lourenço Marques for inspection of ships and warehouses in connexion with maize exports.

HELMINTHOLOGY

Approximately one-quarter of the plots of the new experimental area at Rhodes Inyanga Orchards were examined for the presence of plant parasitic nematodes. Generally the nematode soil populations are numerically at low levels but at least 15 different genera of plant parasitic forms were found to be present. Among the genera discovered in the new orchard area are *Xiphinema* sp., *Longidorus* sp., and *Trichodorus* sp., certain species of which have, overseas, been incriminated as virus vectors. *Xiphinema* occurred in numbers which, compared with those which have been found in other parts of the Federation, were rather high.

A survey is being conducted of genera of plant parasitic nematodes found in association with citrus production and their soil population levels. Investigations are in progress to see whether there is any apparent correlation between high soil populations of parasitic nematodes and low yields of fruit from orange trees.

Two species of root-knot nematodes, *Meloidogyne javanica* and *M. hapla* have been found attacking coffee grown in the Eastern Highlands. The extent and severity of these infestations are not known.

Using the relatively non-phytotoxic nematicide 1, 2, dibromo-3-chloropropane, trials are in progress to ascertain whether at the rates of application being used, there will be any adverse effect on citrus, coffee, apple, pear and peach trees. In addition investigations are being made in relation to nematicidal properties and depth of penetration into the soil. Sample estimations show that seven months after the application of four gallons per acre to soil in which citrus is growing, there is a 99.9 per cent. reduction in the soil population of plant parasitic nematodes and that this control extends to a depth of at least three feet in soils of 33 per cent. clay content. There are not, as yet, any adverse symptoms appearing on the citrus trees.

To find out the effect of date of planting on severity of *Meloidogyne* blistering of potato tubers, trials are in progress at Henderson Research Station. In soil known to be heavily infested with *M. javanica,* nematode-free seed potatoes are being planted at monthly intervals and half lifted when the haulms of the resultant plants have died. The remaining half is lifted a month later. Records of the degree of blistering are being kept and will after twelve consecutive monthly plantings and subsequent harvestings, be compared to see whether and to what degree the date of planting and/or lifting has affected the severity and incidence of infection.

The experiment on the longevity of *M. javanica* in soil was continued and after 3½ years of bare fallow, light infections developed on tomato plants grown in red soil, sandveld and black clayey vlei soil.

A visit was made to the Nematology Section of the Entomology Division of the Government of the Republic of South Africa.

ADVISORY SERVICE

A total of 525 inquiries was recorded at the Salisbury office and 181 at Umtali. Some of these led to the detection of serious pests new to the Federation, one of the most important of these being San José scale. Although both ourselves and the South African authorities insist on the fumigation of nursery stock brought in from areas where this disease occurs, such insistence is not infallible and there is little doubt that successful smuggling occasionally takes place.

Scarcely less important than the discovery of San José scale was that of sorghum midge, *Contarinia sorghicola*. This was found on sorghum at the Sabi Valley Experiment Station in some quantity and subsequently on this plant near Fort Victoria, both localities being in the southern part of Southern Rhodesia. The damage was most severe in the later plantings of a time of planting trial at the Sabi Experiment Station. Wet weather coincided with the flowering of the later plantings and thus conditions were favourable for this pest. Some surveys were made in other sorghum-growing areas but the only positive result was of one sorghum midge collected in a grain head in the Fort Victoria area. Samples of sorghum grain held in store at the Sabi Experiment Station during the dry season have been examined for diapause stage of the midge without success.

Clothes moths are not of regular occurrence in the Federation and it is likely that climatic conditions do not generally favour them. There were two reports this year, one of them unexpected as the insect, *Tineola bisselliella*, occurred in felt washers imported for the motor-car industry. The other infestation was heavy and occurred in the packing material of pillows in a Salisbury warehouse, the insect this time being again, *Tineola bisselliella*.

The existence of citrus bud-mite *Aceria sheldoni* in the Federation was confirmed. Although deformed lemons are quite commonplace in Rhodesia and have been known for many years, and the deformation is known to be generally due to this mite, it has not previously been positively identified. The citrus russet mite, *Phyllocoptruta oleivorus*, was also definitely identified. Russetting of citrus fruits may be due to several other causes and the russet mite is probably not the commonest cause.

A beetle larva, locally termed Fat John, which had previously been observed in Northern Rhodesia causing damage to maize very similar to maize root-worm and in the same areas, was bred and proved to be *Dereodus recticollis*. Its life cycle is not fully known but the adult is long-lived. It appears that the measures used for the control of maize root-worm control this insect also.

An aphid *Smynthurodes betae* West. was found in numbers attacking the underground parts of potatoes on a farm near Salisbury. It was attended by ants and the disturbance of the soil by them no doubt contributed to the crop loss which was estimated at 25 per cent.

A consignment of dahlia tubers which originated from Holland subsequently developed a heavy infestation of larvae of the moth, *Hieroxestis praematura* Meyr. This had not previously been recorded in the Federation and apparently only twice previously, once in South Africa and once in Madeira. A related species *H. subcervinella*, has been recorded as a pest of bananas in the Canary Islands.

Damage to young eucalyptus trees was caused by the beetles *Lipsanus iniquus* Mrshll. and *Eulepida mashona* Arrow. at the Mtao Forest Reserve.

Maize at Salisbury was damaged by the froghopper *Locris arithmetica*. Although this is a very common insect, generally frequenting lush grass on the banks of streams, it seems not to have been noticed causing damage previously. Its feeding caused pale lesions and subsequent withering of the leaves.

A further report of an extensive occurrence of larvae of *Aroa melanoleuca* defoliating *Pinus elliottii* in the Chingamwe Forest Reserve was received.

Now that sunflower is being seriously considered as an alternative crop to maize and is being grown on a larger acreage, pests of this crop have been considerably more noticeable this year. Caterpillars can cause defoliation and a serious outbreak of *Prodenia litura* was recorded at the Kafue Pilot Polder. The flowering heads this year were attacked by *Nysius stali* and *N. natalensis*. These sucking pests were in such large numbers that they caused many heads to shrivel, wither and die without producing any seed. Experiments at Salisbury and Henderson showed that these pests were not susceptible to DDT sprays but were readily killed by malathion or rogor sprays.

American bollworm was also found to be a pest of young seed-bearing heads and might become a limiting factor in seed production.

An agromyzid leaf-miner *Liriomyza brassicae* was recorded causing severe damage to various crucifers, and also peas and sweat-peas near Salisbury. This is the first record of this pest attacking peas.

In the Eastern Districts bean stem maggot, *Melanagromyza phaseoli* caused damage to some extent in most areas, especially where seed dressing was not practised. An arrangement has now been made for all seed bought from Liebig's factory to bear a label with seed dressing instructions. Potato tuber moth, *Gnorimoschema operculella* was of general occurrence. Resistance to DDT has not been reported, but farmers have been advised to alternate DDT with sevin. American bollworm, *Heliothis armigera,* was particularly troublesome towards the end of last year and was seen in large numbers in the Cashel, Melsetter and Sabi areas. Crops attacked included tomato, peaches, lucerne, green beans and sweetcorn.

Lesser army worm *Spodoptera exigua* caused damage to some crops towards the end of last year, especially in the Sabi area where it was seen in large numbers on lucerne and young sweetcorn, but pea crops this year did not suffer from this pest.

In the course of a visit to Northern Rhodesia general lectures on pests were given to farmers and other interested people in Lusaka and Ndola. Mr. Wilson made four journeys to Northern Rhodesia to give specific lectures on maize rootworm and its control at the request of the Ministry of African Agriculture, the Mazabuka I.C.A., the Zambezi Group I.C.A. and the Department of Conservation and Extension. The regular course of eight lectures was given to students at Gwebi College. Other lectures on cotton pests and maize streak were given to farmers at Bindura and on bowling green pests to the Bowling Greenkeepers' Association.

PHYTOSANITARY SERVICES

No changes were made in the published regulations governing the import of plants, though changes in detail were made in the conditions of issue of permits for several plants. The opportunity was taken to overhaul completely the index of requirements for plant imports and this was re-issued on cards to all officials likely to use it extensively.

An extensive amendment to the Plant Pests and Diseases (Pests and Alternate Hosts) Order was made by Federal Government Notice 87 of 1962. The main effect of this was to declare as pests most of the known pests of stored foodstuffs, with the object of enabling inspectors to order treatment when infestations are found. These powers were used in relation to oil-seed cake, imported and distributed widely in the Federation and found to be infested with cigarette beetle and other pests, rice similarly imported and widely distributed and infested with a variety of these pests, malt and beans found infested with Khapra beetle, a consignment of dried fish heavily infested with *Dermestes* sp. and another consignment infested with a mite.

The Plant Pests and Diseases (Pink Bollworm) Order was amended by Federal Government Notice 86 of 1962 in order to exempt from fumigation cotton grown on pink bollworm-free estates in the pink bollworm-infested area.

The Plant Pests and Diseases (Tobacco) Regulations were amended by Federal Government Notice 114 of 1962 in order to permit "discing" to be used as a method of destroying tobacco plants and to prohibit the storage of unsold tobacco of the current season's crop together with older tobacco. The latter practice, if permitted, could result in an increase in the incidence of cigarette beetle since "old" tobacco, by its very nature, permits an increase in any infestation which it may have acquired and thereby presents an increased risk as compared with new tobacco.

An amendment to the Plant Pests and Diseases (Nursery) Regulations was prepared with the objects of raising the fee for nursery registration to £5, making more flexible the conditions governing the sale of pest-free nursery stock and preventing the sale of nursery stock which has been held for a substantial length of time on unregistered premises. The need for the last of these precautions was clearly shown when in the course of an inspection of such nursery stock a dodder, *Cuscuta intermedia,* was found to have established itself on *Deutzia* and to be spreading to other plants standing close by.

Preliminary work was done on regulations for the control of orchard pests in the commercial fruit-growing areas. Their principal object is to enforce measures designed to control fruit flies in the Eastern Districts of Southern Rhodesia.

The plant quarantine greenhouse was completed early in the year and has been in continuous use since then. So far Cavendish bananas from Central America which had undergone preliminary quarantine at Kew, three lots of pine grafting material from Australia for the Southern Rhodesian Forestry Commission and seeds of *Shorea robusta*, imported from India and showing evidence of insect attack have been dealt with.

Inspections of forest tree seed imports in several cases showed evidence of insect attack and in some cases living insects were present even though phytosanitary certificates covering the imports had been issued. In the ordinary course of inspections of plant imports the following especially noteworthy items were intercepted: a consignment of apples infested with codlin moth from South Africa, two consignments of tobacco seed from the Canary Islands, two consignments of apples and one of plums from South Africa infested with a mite *Tetranychus* sp. and a consignment of water hyacinth *Eichornia crassipes*.

There are still no Plant Inspectors for the northern Territories and the Branch is especially indebted to the Horticulturist, Mr. Going, for helping in a number of difficult cases in Northern Rhodesia. The position should be somewhat improved next year when an entomologist of this Branch will be stationed at Lusaka.

At the main ports of entry into Southern Rhodesia, Umtali, Gwelo, Salisbury, and Bulawayo, at which Plant Inspectors operate, 19,956 consignments involving 1,214,586 packages of imported plant material were dealt with, these figures being rather lower than for last year.

Permits for the import of plants issued during the year totalled 754. There have been several instances of persons arranging the import of plants, especially seeds, without first obtaining the necessary permits and this has sometimes resulted in the arrival of the plants without proper phytosanitary certification. This practice causes annoyance, and sometimes loss, to those concerned and is greatly to be deprecated. A poster drawing attention to the reasons for phytosanitary control of imports has been exhibited widely.

An inspection of large quantities of citrus fruit for export at the Hippo Valley was again carried out and phytosanitary certificates were issued. The total of phytosanitary certificates issued rose to 895, much of the increase being due to the increased quantities of tomatoes exported from Umtali.

Because of the modifications referred to earlier in the requirements governing the movement of seed cotton from the Sabi Valley fewer fumigations were necessary than last year. Some of these were supervised on behalf of the Branch by the Officer-in-Charge, Sabi Experiment Station.

The number of nurseries registered in Northern and Southern Rhodesia was 77. The first annual general meeting of the Rhodesian Nurserymen's Association was attended and following this a deputation was received from the Association. Partly as a result of this the amending Government notice referred to earlier was prepared. Representations to control sellers of herbaceous plants as well as nurserymen were not accepted mainly because of the comparatively small danger of spread of pests from this source and the difficulty of administering such control. Alternative suggestions have been made to meet the requirements of people who desire to purchase herbaceous plants free from pests and especially from eelworm.

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HORTICULTURE

With increasing marketing difficulties and lower prices obtaining for agricultural field crops, more interest was taken by farmers in alternative additional sources of income from horticultural production. This meant paying greater heed to water supplies and ways of utilizing this potential.

Growers have given increasing study and attention to crop production during the higher-price periods and the more difficult times of year when home supplies are inadequate.

CLIMATIC CONDITIONS

Conditions were reasonably favourable, with fairly good growing conditions. The rains set in early and peaches and plums benefited considerably from a high field capacity moisture content of the soil when the fruit was developing.

After a temporary drought spell, heavy and frequent rains occurred in February and March in Mashonaland, and lack of sun made vegetable cropping difficult. The drought continued in the Eastern Districts and apple crops suffered. Little hail damage occurred to fruit trees.

Although low night temperatures were common during winter, few severe frosts were recorded. Two late frosts in August did considerable damage to tender vegetable crops and potatoes.

FRUIT

Citrus

Citrus crops were good and marketing problems few. Slightly lower average prices for oranges and naartjies were realized. Growers in the Eastern Districts welcomed the imposition of permit control importation on citrus fruits from Moçambique. There is still more scope for larger supplies of late season oranges for October and November marketing and also for maincrop and late naartjies.

Voluntary grading and packing standards for citrus fruits for sale locally were introduced by the Rhodesian Co-operative Fruit Growers' Association. There was a steady improvement in fruit quality and its presentation.

A few thousand cases of citrus were exported to Europe via the port of Lourenço Marques in association with the Citrus Exchange of South Africa which carries out the necessary fruit inspections. Some oranges suffered from Rind-oil Spot *(Oleocellosis)* after packing and had to be sorted out and repacked to comply with export standards.

The large-scale expansion of orange tree plantings at the Mazoe Citrus Estate continued and is being spread over several years. New plantings commenced about two years ago are growing well. All these nursery trees are locally grown. Some new plantings of Valencia Late oranges were made in the Beitbridge area on two estates.

Central Statistical Office returns of established citrus trees for 1960/61 were as follows:

	Trees	*Value of Fruit Sold or Processed*
Southern Rhodesia		£
Orange	424,000	229,000
Other citrus	105,000	24,000
TOTAL	529,000	£253,000
Northern Rhodesia		£
Oranges	74,000	35,200
Other citrus	34,000	8,800
TOTAL	108,000	£44,000

These returns show a marked all-round increase on the previous year.

Sub-tropical Fruits (other)

Only small new plantings were made, which will have little impact on market requirements. There is still much scope for increased production of most of these fruits, which are readily grown here. The absence of frosts was beneficial where young trees were being established.

Bananas.—Expansion of Cavendish banana planting and a greater measure of self-sufficiency of fruit was reported at Lusaka, where production is close to the consuming centre. Transport difficulties and long distances between the growing areas and the major towns of Salisbury and Bulawayo are present major drawbacks to expansion in Southern Rhodesia. From the statistical returns for Southern Rhodesia there are approximately 500 acres of bananas planted.

Papaws.—This fruit is grown in all the warmer parts of the country with little difficulty and produces early season supplies. In the Shamva area one farmer specializes in papaws for Salisbury markets. Later-season fruit is produced in the Salisbury district. Here much ripe fruit rot disease again occurred this year due to a spell of low night temperatures causing a check to growth.

Avocados.—Production continued on a small scale with few specialized growers providing a long season continuity of supply. Most fruit is marketed loose. Large imports of avocados were received from Moçambique throughout the season.

Mangoes.—This fruit is much in demand, and is imported in quantity. Commercial production is still far short of local requirements, and earlier supplies from the warmer, lowveld areas could be readily absorbed by local markets. Nursery trees of the new Umtali Stringless Mango were made available from Premier Estates nursery and met with popular demand.

Pineapples.—Pineapples are being grown in the Eastern Districts to only a very limited extent, more interest being taken in coffee production in the suitable areas. Production is small also in other areas and more regular supplies of fruit at commercial prices are needed by markets.

Deciduous Fruit

The mild winter resulted in lack of chilling during the dormant season. This delayed spring growth and flowering was haphazard and spread over a longer period. Where apple trees were sprayed with D.N.O.C. oil spray, as recommended to control such delayed foliation, it proved most effective.

Deciduous fruit production continued to expand, especially with peaches and plums, for the early and mid-season periods. With many trees still in the early years of bearing, yields should increase progressively and to a considerable extent.

New plantings of apple trees were on a limited scale, growers being loth to commit themselves too far ahead. The market is wide open for larger supplies, especially for the popular varieties, the names of which are well known to the public.

Fruit Crops

Plum trees set a smaller crop than usual with the much earlier rains, resulting in increased size of fruit and overall yield was good. Peach crops were small, especially the clingstone canning types, due to late frost. Little hail damage occurred.

Apples suffered considerably from the drought at mid-season when the fruit was half grown and this resulted in decreased size which affected the demand. Import control was lifted towards the end of March.

Marketing

Except for difficulty with smaller-sized apples, fruit marketing was satisfactory, the main difficulty being an insufficient supply.

The Eastern Districts Deciduous Fruit Pool on behalf of members handled fruit of the higher grades and arranged distribution, the Umtali Farmers' Co-op acting as secretaries. Modifications to the voluntary grading and packing regulations were found necessary in the light of experience.

Several meetings with growers, traders and the Pool members were held throughout the year. Sample lots of Pool fruit in season were inspected regularly by the plant inspectors at the Umtali and Salisbury railway stations and reports were submitted. The horticulturists at Salisbury and Umtali also made check inspections.

Viticulture

Statistical returns indicate that the area of grapes established is just under 150 acres and only small additional plantings were made during the year. There is still only a limited quantity of grapes being marketed. Late supplies from Umtali were marketed in Moçambique.

Wine on a limited commercial scale was produced by one Rusape and two Salisbury growers. Many inquiries on grape growing and wine possibilities were received.

Due to the early onset of rains, the fungus disease anthracnose occurred in many areas.

Deciduous Fruit Tree Returns

Statistical recordings of deciduous fruit tree populations for 1960/61 for Southern Rhodesia were as follows:

Apple	71,000
Peach	91,000
Plum	22,000
Pear	9,000
Apricot	3,000
Grapes	66,000
TOTAL	262,000

Plantings of peaches showed the main increases, and to a lesser extent, apples and pears.

Fruit Importations

Federal imports of the various kinds of fresh fruits for 1961 were as follows:

	Tons (2,000 lb.)	*Value £*
Apples	2,758	170,055
Plums	234	14,198
Grapes	1,485	77,415
Deciduous (other)	1,421	88,013
Citrus	875	15,582
Bananas	5,523	68,782
Sub-tropical (other)	542	21,594
Other Fruit	513	15,553
Fruit (preserved, frozen, etc.)	2,108	239,685
TOTAL	15,459 tons	£710,877

While there has been a progressive decrease of importations over the past four years, there is still very considerable scope for local production and greater self-sufficiency.

TEA

Expansion in the tea industry was well maintained. For Southern Rhodesia its recorded total acreage for 1961 was 3,890 of which 3,020 acres were productive and yielded 2,379,000 lb.

A tea factory on a new estate at Chipinga was under construction. A small trial planting of tea under irrigation was made at Enterprise near Salisbury.

The Nyasaland tea returns for 1961 recorded a total of 29,902 acres with over 25,000 acres productive and 31,518,000 lb. produced. Total Federal tea exports for 1961 were 15,026 short tons.

COFFEE

Sustained interest in coffee production has resulted in increased acreages in Southern Rhodesia. The 1961 acreages increased by 112 to a total of 420. Of this 170 acres are in the early stages of production, the yield being 9½ tons. Only Arabica coffee is being grown.

Research work is being carried out on two and three-year old coffee bushes at the Experimental Farm, Chipinga, where comprehensive experiments are under way.

Northern Rhodesia had 30 acres of coffee, and Nyasaland an unstated acreage that produced 120 tons in 1961. A specialist coffee officer is being appointed.

VEGETABLES

Fresh Vegetables

Production was maintained at last year's increased acreage, the recorded total for 1961 for Southern Rhodesia being 5,900 acres. Due to various difficulties and also to the closing of the canning factory at Cashel, there was a marked decrease in the quantity of vegetables used for canning and dehydration as compared with the previous season. All such Eastern Districts processing is now concentrated at the Umtali factory.

Climatically the year was favourable on the whole for crops, but Mashonaland suffered from extensive rains in March which severely affected vegetables, and fungus diseases were rife. Matabeleland on the other hand, suffered from drought. It therefore became necessary for vegetables to be imported from South Africa for Salisbury and Bulawayo in order to make up the shortages. There is normally an appreciable amount of fresh vegetable trade between Umtali and Salisbury, with extension onwards to Gwelo and Bulawayo in season.

In Northern Rhodesia approximately a thousand acres of vegetables were grown but some importation was necessary during the heavy rains. Standards of production have much improved with a marked increase in yields.

Onions

While the Southern Rhodesia onion acreage for the year increased to 360, returns show a marked reduction in yields, which are difficult to account for. Standards of production by most regular growers were much improved and greater attention was paid to onion storage needs. Seasonal prices were lower. "Cape Flat" is the most popular variety grown as it ripens off readily and keeps well until restrictions on importation are lifted at the end of February. Short day hybrid strains of onions from the U.S.A. have been under trial here for the past two years and have done well. Dessex Hybrid and Granex were the most suited ones. In Northern Rhodesia onion returns for the year were 120 acres grown and 7,900 bags (120 lb.) reaped.

Vegetable Research

Vegetable research work was continued at the Henderson Research Station on onions, tomatoes, cauliflower, peas and beans. Times of sowing, spacing, nitrogen rates and water requirements were the main experiments carried out. Progressive results of such work are presented in the Henderson Station reports.

Vegetable Exports

Exports for 1961 were:

	Tons (*2,000 lb.*)	*Value* £
Dehydrated vegetables	137	110,477
Others, preserved	79	7,077
TOTAL	216 tons	£117,554

Vegetable Importation

Details of imports for 1961 are as follows:

	Tons	£
Fresh Vegetables	943	31,216
Preserved (other)	1,203	163,905
Frozen vegetables	142	28,883
Onions and Garlic	2,422	88,774
Beans and Peas, preserved . . .	714	65,775
TOTAL	5,424 tons	£378,553

There has been a progressive decline in importations over the past two years.

ESSENTIAL OIL

Investigatory work was continued with the scented foliage geraniums *(Pelargonium)* for the extraction of essential oils. Local material was sampled by arrangement with the Chemistry Branch, and oils were sent to London for evaluation. A few farmers made trial plantings on a limited scale.

NURSERIES, PLANTING MATERIAL, CUT FLOWERS

For the year under review there were 63 registered nurseries in Southern Rhodesia and 11 in Northern Rhodesia. In general, trading improved slightly but remained lower than three years ago. The traders have organized themselves into a Rhodesian Nurserymen's Association.

Importations of planting material for the Federation for 1961 were:

	Value £
Trees and shrubs .	15,215
Plants	7,704
Bulbs and tubers .	13,509
TOTAL . . .	£36,428

Cut flower imports totalled £9,984.

Two market gardeners in the Salisbury area are producing chrysanthemum cut flowers all the year round by the use of artificial light stimulation to control photoperiodism.

HORTICULTURAL SERVICES

Requests for horticultural services continued to increase considerably and embraced all aspects of horticulture and the horticultural industry. Unfortunately it was impossible with the limitation of staff to cope with all requests and to give effective service as required.

When the vacant post of horticulturist for the Matabeleland/Midlands region is filled, the outside areas will be reasonably well served. In Mashonaland the position is still unsatisfactory and the Senior Horticulturist found it difficult to handle all the administrative, liaison and specialist advisory work expected of him.

The Chief Horticulturist is at present undergoing intensive training in South Africa and there should be a considerable strengthening of the Branch when he returns next year.

Co-operation with headquarters staff and field officers of the Department of Conservation and Extension was well maintained and much horticultural information and assistance was provided. Close liaison existed with the Economics and Marketing Branch of the Ministry on investigations into additional crops, and regular contact was maintained with the Municipal produce markets and wholesalers of fruit and vegetables.

Five lectures on fruit and vegetable production and marketing and one demonstration practical talk were given to senior students at Gwebi Agricultural College. Similar talks and demonstrations were given to various organizations.

Horticultural Articles

It was only possible to write a limited number of technical articles. Many interviews were held with various correspondents and information provided for publication. Numerous articles on horticultural subjects were received for checking, comment and criticism prior to publication.

SHOW JUDGING

Fruit, flowers and vegetables were judged at the various annual horticultural and/or agricultural shows throughout the country. Demands for such services have increased considerably and to ease the situation learner judges have been brought in as assistants, to gain experience. The standard of exhibiting and presentation continues to improve.

AGRICULTURAL EXPERIMENT STATION, SALISBURY

Had the distribution been better the seasonal total of 31.61 inches of rain which fell on the station would have been adequate for the production of high yields of all crops. But splendid planting rains which fell during the early part of November were followed by one dry spell which lasted until Christmas and a second which started in the latter part of February and persisted throughout March. Although maize and potatoes wilted quite badly during the first spell the second may have done more permanent damage because most crops, and particularly maize, which was then cobbing, were at a more vulnerable stage.

FERTILITY TRIALS

Three of the most intresting fertility trials in progress on the station are those designed to measure the effect of returning crop residues to the soil, the residual effect of management and fertilizer treatments of grass leys when followed by arable crops and the rotational effect of a range of crops grown in sequence with maize.

From the first of these trials—that in which a number of methods of using crop residues are compared—there is little new to report at the conclusion of the 1961/62 season. Results have followed the pattern of previous years although the increased yield of maize, both when the crop residues are ploughed back and when they are returned in the form of animal compost, was a little greater than usual. Also the detrimental effect on maize yields of leaving the residues as a stubble mulch was not so marked. It may surprise some people that the increased yield from ploughing the residues back has not averaged more than 6.5 per cent., or 1.62 bags per acre, over seven seasons. Most remarkable from the 1961/62 results is the higher percentage of diseased grain, 9.59 per cent., from the stubble mulch plots compared with 2.13 per cent. from the control plots.

A second maize crop was planted to measure the residual effect of a number of management and fertilizer treatments of a Panicum Makarikari ley and this year all plots received equal applications of phosphates and nitrogen. Throughout the period of the ley, nitrogen was applied at three levels, 0, 80 and 160 lb. of nitrogen per acre per annum, and this year the residual effect was very considerable and gave significant increases in yield.

YIELDS OF MAIZE
(in bags of 200 lb. per acre)

Season	*0-N*	*80-N*	*160-N*
1960–1961 . .	15·25	15·90	19·63
1961–1962 . .	20·75	24·50	28·87

The residual effect of the management treatments carried out on the ley was measured but differences between treatments were not great enough to be significant. Nevertheless maize yields were 2¼ bags per acre higher on the plots where the grass had been cut and left on the ley as a mulch than on the plots where it had been grazed or cut and removed for hay. It remains to be seen how long the residual effects of the ley treatments persist. The cost of applying 160 lb. of nitrogen to an acre of grass is approximately £8. Altogether 720 lb. of nitrogen was applied to these high-level plots during the period of the ley and, at present prices, this costs about £36. So far, the residual effect has been an increase in yield of 12½ bags per acre.

The investigation into the effect of introducing a number of different crops into maize rotations is still in its early stages. The 1961/62 results suggest that differences in rotational value may prove to be closely associated with the effect of each crop on the nitrogen and moisture status of the soil. Higher yields of maize can be obtained without applying any nitrogen after legumes such as velvet beans, soya beans and sunnhemp than with 40 lb. of nitrogen per acre after non-legumes such as sunflowers. This investigation is providing further evidence that leguminous green manures have some additional, but as yet undetermined, beneficial effect on maize yields which cannot be obtained by the direct application of chemical fertilizers.

It is possible that the falling price of maize today, and the necessity for a compensating reduction in the cost of production, may have a considerable influence on cropping practice. The decline in the popularity of green manuring, as the drop in acreage from 133,481 in 1954/55 to 71,070 in 1960/61 clearly shows, may be halted. Where other cash crops cannot be grown at an economic level the re-introduction of green manures, which can make available to the following maize crop as much as 100 lb. of nitrogen, from a bag costing approximately £5, may be economic and help to lower costs of production.

MAIZE

With a fall in the price of maize it has become even more important that farmers consider every means of reducing costs of production if they are to continue to grow maize economically. To do this every factor influencing the yield must be considered and as far as possible optimum conditions secured for each. Much of the work in progress on the station is designed to this end; to find out the most suitable variety, the optimum population for that variety, the ideal time of planting, the most economic dressings of fertilizer and the best way and time to apply them. It must be remembered too that the chain is a strong as its weakest link. No factor having an influence on yield can be ignored.

Breeding

During the year under review discussions which had been in progress for some while culminated in the Government reaching agreement with the Seed Maize Association to hand over to them responsibility for the production of inbred and single hybrid parent seed. The Ministry for Agriculture will remain responsible for producing sufficient "breeder's seed" of all inbred lines in commercial use; and insists that "breeder's seed" is used whenever it becomes necessary to bulk up further stocks of seed of each inbred. It is probable that this rearrangement of responsibility would not have been possible if the Salisbury Farmers' Co-op had not agreed to assist the Association financially and to undertake the management of this seed production. One advantage of the new set-up is that the agents responsible for selling the seed, who are in the best position to estimate the demand for seed of each individual hybrid, can arrange production accordingly. All stocks of parent seed have now been handed over to the Association at the agreed prices.

Twenty-six variety trials were laid down to cover all the chief maize-growing areas in Southern Rhodesia and Northern Rhodesia and only one of these was a total failure. There is no doubt that the standard of efficiency of management of these trials has improved greatly in the last three or four years; most of the errors which arise today are due to insufficient attention to the instructions issued for each trial. On the average, yields were a little lower than those from the 1960/1961 trials, a result which can be attributed entirely to less favourable seasonal conditions. Included in these trials were all the hybrids available commercially, augmented on the research stations by a number of particularly promising experimental hybrids. The following were the average yields for Southern and Northern Rhodesia:

MEAN YIELDS OF GRAIN
(in bags of 200 lb. per acre)

Southern Cross	*S.R. 10*	*S.R. 11*	*S.R. 13*	*S.R. 51*	*S.R. 52*	*58 H6*	*60 H12*
22·80	25·90	25·96	29·33	28·99	34·38	31·96	26·65

58H6 and 60H12 are experimental hybrids. SR51 and SR52 are single hybrids. SR52 (N3-2-3-3 x SC5522) has averaged five bags an acre more than the best of the double hybrids, SR13, which in turn has outyielded the other double hybrids, SR10 and SR11, by nearly 3½ bags an acre. SR52 gave a higher yield than any of the double hybrids in all 25 trials which were located from the Copperbelt in the north, which experienced over 70 inches of rain this season, to Fort Victoria and Chipinga in the south. Its adaptability to a wide area, and to the varied conditions found throughout this wide area, is one of its most notable attributes. Unfortunately seed of this hybrid is still in short supply but every effort is being made to step up production as rapidly as possible. At present prices, and at normal population rates, the use of single instead of double hybrid seed increases the cost of production by from 25s. to 30s. an acre. In spite of this, the increased yield which can be anticipated, at any rate on the more fertile soils in the higher rainfall areas, makes the use of SR52 perhaps the most promising way of lowering the cost of production per bag.

During the year a new post of plant breeder was established and filled, and he will work on yellow maize. After a visit to the United Kingdom and certain countries on the European Continent, the chairman and the general manager of the Grain Marketing Board reported that the market for white maize was a limited one and that once its requirements had been satisfied, yellow maize was rather easier to sell and sometimes commanded a premium price. It was accordingly decided that yellow hybrids, capable of yields comparable to those obtainable from the white hybrids in use at present, should be developed as soon as possible. In the first instance the aim is to produce yellow versions of the best of the white hybrids and this involves producing the yellow counterparts of the inbred parents of these hybrids. In the case of some inbred lines this work is well forward. On a long-term basis new lines will be developed from yellow open-pollinated varieties which are being grown locally and from material imported from countries having similar climatic conditions. This work is being started in the 1962/1963 season.

It is possible that the extraction of the oil and the use of the residues for industrial purposes, or for livestock food, might prove a more profitable way of using some of the surplus maize which is today exported and sold at world prices. It is thought that this oil extraction might prove uneconomic with varieties containing the normal 4½ per cent. oil. Therefore some attention is being paid to the development of high-oil hybrids. In doing this consideration will be given both to oil content and to combining ability. Experience in the United States has shown that straight selection for high oil content has invariably been at the expense of yield.

Population Trials

Two trials were carried out; the object of the first is to determine the optimum population for each of the hybrids in commercial use and that of the second to see how varieties of different habit of growth and maturity rating react to changes in population and date of planting.

The first of these trials was in its initial season and, on a single year's results, it would be unwise to make definite recommendations. Each variety is tested at five population levels ranging from 9,680 to 19,360 plants per acre. This season the single hybrid SR52 gave an increased yield with each increase in population, reaching 59.14 bags per acre at the top population level. SR11, on the other hand did not respond to an increase in population beyond 14,520 plants per acre. It remains to be seen whether confirmation of these results will be obtained this coming season.

In the second trial four varieties were planted at three population rates on 13th November, 27th November and 9th December.

YIELDS OF GRAIN
(in bags of 200 lb. per acre)

	60 H12	*51 H37*	*59 DH2*	*58 H6*	*Mean*
13/11/61 .	36·19	43·06	44·28	49·55	43·29
27/11/61 ·	37·34	39·69	40·79	43·36	40·31
9/12/61 ·	29·72	35·86	32·16	33·91	32·92
Mean . .	34·42	39·54	39·09	42·28	

The four varieties were selected from the available material to give as wide a range in height and time taken to mature as possible. 60H12 is the shortest and quickest maturing of the four, 58H6 the tallest and slowest maturing. The other two varieties are intermediate. As anticipated the yield of 60H12 has not fallen away with late planting to the same extent as that of 59DH2 and 58H6; but it is significant that, even when planted as late as December 9th, the slow-maturing varieties are still capable of higher yields.

All the interactions in these trials are not yet clear but all varieties every year lodge to a greater extent at the higher population levels and, as higher populations are now widely in use, the need for very careful selection for resistance to lodging during the development of new inbred lines has become even more essential.

Fertilizer Trials

There is very little to report from the maize fertilizer trials this season. The response to nitrogen was a little greater than normal on this station—nearly seven bags an acre for the first 66 lb. of nitrogen. As usual on the station heavier dressings than this were hardly economic. The response to nitrogen applied to and residual from the previous year's maize crop was just over three bags an acre from an application of 100 lb. of nitrogen per acre. The mean residual response obtained in this trial for the last three seasons is 2.91 bags per acre from the application of 100 lb. of nitrogen. Recovered as maize the residual value of this nitrogen is nearly £4, a very considerable sum which is additional to any profit made in the season in which the nitrogen was applied.

WHEAT

At the time of writing the annual report for 1960/61 the yields from the winter trials were not available. Several varieties produced more than 20 bags an acre in the yield trials which were planted on 17th May, a date probably a little later than optimum. The 1961/62 summer trials were very successful and a number of varieties gave yields higher than any previously obtained in the summer. Marodzi yielded at the rate of 14.2 bags an acre. Nevertheless the high temperatures in the summer have such a limiting effect that it seems important to arrange the planting date of the winter crop so that the wheat has the full benefit of the lower temperatures of that season. It was therefore decided to compare all the varieties, in the 1962 trial, at three dates of planting, 4th April, 25th April, and 16th May. Six of the eight varieties gave the highest yield when planted on 25th April, and the mean of all eight varieties was 15.9, 18.7 and 16.5 bags an acre for the three planting dates respectively. This confirms the existing belief that the latter part of April or very early May is the optimum time to plant most varieties.

Four varieties of barley, included in these trials to obtain some data on the relative yields, and therefore the profitability of growing wheat and barley, averaged 13.5, 12.1 and 11.3 bags an acre at the three planting dates, indicating that earlier planting may be desirable for barley. The drop in yield more than offset the price advantage of approximately 10 per cent. which barley has over wheat.

Amongst the breeding material two crosses show particular promise; both have good resistance to stem and leaf rust.

Kafue x S29A1

A large number of selections have been isolated from this cross, now in the F5 generation. It is hoped that some of these selections will be high yielding and have good baking quality as well as rust resistance.

F394 x Kafue

The dwarf habit of growth of the Italian mother parent, F394, has been retained in this cross together with the stooling and rust resistance of Kafue. Both parents have good baking quality.

Altogether twelve samples of wheat were submitted to the Rhodesian Milling Company for baking tests and of these four were classified as strong wheat in a blend and four as useful fillers.

At present the two recommended varieties are Mazoe and Marodzi, the latter particularly for soils of low fertility. Because of its susceptibility to rust, S29 has now been withdrawn; and F260A1, Kafue and a type of Gabo are no longer recommended generally because of lower yield.

POTATOES

The breeding programme has been interrupted by the resignation of Mr. V. J. Montague. This is particularly unfortunate and it is hoped that he will be replaced as soon as possible.

During the season further progress was made in the development and testing of varieties resistant to Late Blight, *Phytophthora infestans,* and of satisfactory tuber quality. Approximately thirty seedlings from crosses made in 1960 and 1961 were selected for further trial; all these selections are blight resistant and have the white-skinned white-fleshed tubers favoured by consumers in this country. Two seedlings were retained from material originally supplied by the Department of Agriculture for Scotland and seven seedlings from material provided by Dr. Howard of the Plant Breeding Institute, Cambridge.

Planting was completed early in November and the long, dry spell which followed delayed the development of late blight. Considering the drought, yields were satisfactory although the incidence of growth irregularities in the tubers was high. Observations and yield trials again demonstrated the superiority of Walanga, in terms of blight resistance, yielding ability and general tuber quality, over most recently introduced varieties. The Dutch variety Atleet showed promise.

In the manurial trial significant responses were obtained to applications of nitrogen, potash and kraal compost. None of the treatments had, however, any significant effect on the dry matter content of the tubers.

LEGUMES

Growth of some of the legumes, particularly the velvet beans and some fields of soya beans, was excellent. Whilst it is not clear which factor or factors were responsible for the unusually high yields of these crops, it is possible that applications of lime may have proved beneficial. The velvet bean variety 18 yielded at the rate of nearly 16¾ bags of seed an acre, apparently the highest yield yet recorded on this station. The field used for soya bean introductions was also limed and some lines of Hernon 147, used as standard variety for comparison, reached a yield of 20 bags an acre at a normal spacing and date of planting. These results were most encouraging and some of the land where legumes are to be sown in the coming season has been limed in preparation.

In recent years the growth of early sown Grotalaria ochroleuca has usually, by the end of the season, been substantially better than that of sunnhemp. Unfortunately this crotalaria grows very slowly for the first six or eight weeks after germination and therefore is unable to compete with weed growth in the same way as sunnhemp. It was hoped that a light seeding of sunnhemp, in mixture with the crotalaria, would provide a nurse crop during this early period and that the crotalaria would eventually make the bulk of growth required from a green crop. The mixture this year was not as successful as hoped; the sunnhemp smothered most of the crotalaria as well as the weeds!

A post for a plant breeder to work on leguminous crops was established but has not yet been filled. On his appointment consideration will have to be given to the priorities of a number of projects which need to be carried out. Important amongst these is the development of new soya bean varieties. Although none of the soya bean introduction proved capable of outyielding the best of the established Hernon varieties, some of them have certain characters of value which could usefully be transferred to the Hernons. A second project needing urgent attention is the development of a vigorous crotalaria having the quick initial growth of sunnhemp and the resistance to Colletotrichum stem break which Crotalaria ochroleuca possesses.

GENERAL

A field-day was held for the Mashonaland Farmers' Association in late March but was very poorly attended. Two demonstrations of the roguing of off-type plants from fields of parent seed maize were held on farms in the Salisbury area for the benefit of members of the Seed Maize Association who are engaged in the production of single-hybrid seed. The first of these, on Mr. H. V. Wheeler's farm, Calgary, was very well attended. The officer-in-charge attended, and spoke at, farmers' meetings at Banket, Raffingora and Shamva, soya bean field days at Gwebi and Glendale and a field day on Mafuta, Mr. F. A. Alexander's farm.

The officer-in-charge continued to serve on the Executive Committee of the Seed Maize Association, the Field Experimentation Committee (with Mrs. N. Fitt), the Fertilizer Advisory Committee and the Committee for the Maize and Agricultural Produce sections of the Rhodesia Agricultural and Horticultural Society. The potato breeder served on the Ministry's Show Committee and on all potato committees.

An Agronomy Conference was held in March for all agronomists and plant breeders within the Department. Gwebi Agricultural College and this station acted as joint hosts for this Conference.

PUBLICATIONS

A. G. H. Rattray, Esq.:

1. "Results of Experiments, Season 1960-1961", *Rhodesia Agricultural Journal,* March-April, 1962.
2. "Maize Improvement and the Development of Hybrid Maize in Rhodesia", *Rhodesia Agricultural Journal,* May-June, 1962.
3. "The Soya Bean", *Rhodesian Farmer,* 11th May, 1962.
4. "Post War Developments in Maize Production in the Federation", *Farmers' Weekly* Supplement, 18th July, 1962.
5. "The Sunnflower", *Rhodesian Farmer,* 1st June, 1962.

EASTERN HIGHLANDS RESEARCH STATION — MELSETTER

INTRODUCTION

Staff.—There were no staff changes during the year. Both the Officer-in-Charge, and the Technical Assistant took 30 days' vacation leave.

Labour.—Numbers remained fairly constant around 30. Wages increased slightly to conform with local rates.

Compound.—Some reconstruction was necessary to make way for orchard extension.

Building.—A concrete and brick lamb suckling pen was built to accommodate an internal parasite trial. A milking parlour was redesigned and rebuilt as a walk-through four-abreast unit.

Fencing.—Existing fencing was renovated and veld camps for a grazing capacity trial were laid out, nearly three miles of fencing had been erected by the year's end.

Timber.—A plantation of 2,000 *Pinus patula* was planted during January.

Orchard.—The existing area has been expanded by eight acres. Fencing and furrow extension were completed.

Field Days, Visits, etc.—The Farmers' Liaison Committee met in Umtali on the 13th July. A beef day was held on the 10th April, which 25 people attended. Three newsletters were distributed to I.C.A.s in the Eastern Districts, and an article on the station's work and future plans was published in the Show Supplement of the *Umtali Post.* Some 220 visitors came to the station during the year. The Officer-in-Charge attended two agricultural shows and visited six farms during the year.

WEATHER

Though the season's rain was above average, it's distribution was erratic. The winter was exceptionally dry with less "guti" than usual, and several severe frosts occurred.

	Inches	*Rain Days*	*12-yr. Average*
Oct., 1961 to April, 1962	43·17	94	38·33
May, 1962 to Sept., 1962	1·40	15	3·83
YEAR'S TOTAL . .	44·57	109	42·16

DAIRY

A major station policy change took place during the year. The dairy herd was dispersed at an auction sale in early September, to make way for an increased emphasis on beef, sheep and horticultural work. As in recent years no concentrates were fed to the dairy cows. The irrigated rye grass/clover pastures provided for "steaming up" and for the early summer lactation period. Dryland Kikuyu and Paspalum pastures carried the herd from January to the end of April when Napier fodder and dahl took over. The small Friesland element appeared less able than the Jerseys to maintain it's milk yield and general condition during the winter months without concentrates.

BEEF

This year the work with beef was in the nature of an exploratory exercise. A simple comparison between different types of winter and summer feeding was undertaken. Three groups of five animals were selected and the treatments were as follows:

Group I.—Kikuyu/clover pasture receiving no artificial nitrogen. A five-acre pasture was allotted to the group from January.

Group II.—Unrestricted veld grazing during the summer moving to three acres of second-year dahl *(Cajanus cayan)* plus four acres Napier fodder *(Pennisetum purpureum)* for the winter period.

Group III.—Unrestricted veld grazing summer and winter.

The summer period ended on the 14th May when Group II moved into the seven acres of dahl and Napier fodder and supplementary protein was fed to all groups from that day. The supplement was cotton-seed meal and a maximum ration of 2 lb. per beast per day was fed. The date of beginning and when to increase the ration was governed by the weight gain of the Veld Group III.

A cattle weighing scale will be in action early next year, but this year weight gains were measured by a weighband. This method proved to be so inaccurate that precise observations are not possible. However, broad conclusions can probably be drawn sufficiently accurately for the purpose of this year's investigation.

	Group I Average			*Group II Average*			*Group III Average*		
3-Month Period	*lb. Init. Wt.*	*lb. Fin. Wt.*	*Per cent. Inc.*	*lb. Init. Wt.*	*lb. Fin. Wt.*	*Per cent. Inc.*	*lb. Init. Wt.*	*lb. Fin. Wt.*	*Per cent. Inc.*
Jan.-Mar.	436	613	40	439	594	35	435	575	32
Apr.-June	613	718	17	594	687	16	575	629	9
July-Sept.	718	773	8	687	791	15	629	727	16
9-Month Period.			77			80			67

It is apparent that Kikuyu/clover pasture gave the best gain during the summer but this slowed down during the winter despite there being adequate foggage grazing available and a protein ration supplied. The best winter treatment was the dahl/Napier fodder foggage plus protein. The improvement in Group III on the veld during the late winter and spring is attributable to their having access to young veld after an early burn.

It would seem from these results that half an acre of Kikuyu/clover "low cost" pasture receiving lime and phosphate costing annually 36s. per acre should keep weaners growing at a rate of 2 lb. per day during the summer months. Comparing this with veld grazing, a slower gain would be expected from a much larger acreage. A veld carrying capacity trial is due to start shortly, which should indicate what this area might be.

For the winter period three-fifths of an acre of dahl and four-fifths of an acre of Napier fodder plus protein supplement gave a daily gain of approximately 1¼ lb. per beast. The cost of the supplement from May to November is 121s. per annimal and if this were cut out it would seem reasonable to expect a gain in the region of ½ lb. per day.

A possible system, which will be put to the test in the coming season, may emerge as follows:

		lb.
July	Weaners arrive weighing	400
July to November . .	Napier fodder silage (gain of ⅔ lb. per day) . .	500
December to April . .	½ acre Kikuyu/clover (gain of 2 lb. per day) .	800
May to November . .	1½ acres dahl/Napier fodder (gain of ½ lb. per day)	900
December to January .	⅓ acre Kikuyu/clover (gain of 2 lb. per day) . .	1,010

The Napier fodder silage would be conserved during the summer from the area which would later provide the winter grazing. Thus 2⅓ acres may prove to be sufficient to take a seven-month weaner through to slaughter weight in a year and seven months.

Beef Weaners

Forty Hereford weaners arrived during June and have been maintained on silage and hay. They will be grouped for trial purposes when the cattle scale is installed.

Friesland Beef

Dairy bull calves that had been bucket-reared showed promise of reaching slaughter weights at an early age as reported in last year's report. Winter feeding of these animals this year gave disappointing results. Frieslands of a comparable age with Herefords and receiving the same treatment were less able to maintain weight gains, and would seem to require a much higher standard of winter feeding.

SHEEP

Spring Lambing 1961

This was very disappointing, when due to infertility of the ram only 13 ewes out of a possible 60 produced 16 lambs. These lambs were used for internal parasite investigation. A three-day shift system of grazing was adopted behind metal hurdles, and no anthelmintics were used. Although fresh ground was used for each shift, a heavy worm burden built up. A single dose of phenothiazine brought the average worm egg count down from 12,900 to 457 per gramme. The growth rate of the lambs responded immediately. Cultures by the Veterinary Department showed that the species involved were:

Nodular worm (Oesophagostomum)	42 per cent.
Wire-worm (Haemonchus)	46 per cent.
Bankrupt worm (Cooperia)	3 per cent.
Bankrupt worm (Trichostrongylus)	9 per cent.

Autumn Lambing 1962

A successful lambing gave 113 per cent. increase on the number put to the ram and two ewes failed to conceive. The average birth weight was 8.9 lb.

Worm-free Production

Under the guidance of the Veterinary Department an attempt was made to raise the autumn-born lambs hygienically on concrete. The intention was to produce the nucleus of a worm-free flock which was to be carried on pastures which have been kept free of livestock for a period of two years. At the same time worm-free individuals would be available for further investigation of parasite problems. Despite the greatest care, when the lambs were between two and three months old, they were found to be infected. It was thought that this was due to grass from the "clean" pastures being fed to them, whch indicated that the two-year stock-free period may not be effective in eliminating infection. However, on Veterinary Department advice the lambs will be dosed with some of the newer anthelmintics, and if this is effective the lambs will be turned on to clean pastures as planned.

Spring Lambing 1962

A small group of ewes lambed in September. The average birth weight was 10.07 lb. These lambs are also being reared on concrete.

Wool

An average clip of 4½ lb. per ewe sold for an average price of 3s. 2d. per lb. in Durban.

TRIALS

Kikuyu Nitrogen Trial

This trial was carried on for its second season. Applications of 200, 400 and 600 lb. per acre of Calcium Ammonium Nitrate were applied as before on an old clover-rich pasture A, and on a younger pasture B that had no clover. Yields in general were higher due to the wetter season. Whereas last year 500 lb. C-A-N was needed in pasture B to equalize the yield of O nitrogen plots in pasture A, this year only 200 lb. was necessary. In the first year the 500 lb. requirement could only in part be attributetd to the contribution of the clover, due to the disparity in age and therefore productivity of the pastures. Pasture B has now returned to normal production after renovation in 1960. The 200 lb. requirement this year is probably a nearer assessment of the clover's contribution. Heavy nitrogen dressings over two years have depressed but not entirely eliminated the clover. In addition the yield increases from the higher nitrogen dressings in the clover pastures were relatively less than in Pasture B. From this, it would seem that, having regard to cost and the survival of the clover, a general recommendation would be to apply 200 lb. C-A-N initially and 100 lb. after each cut or grazing.

Protein values were highest where nitrogen was added in the presence of phosphate, and lowest where lime and potash were present in addition. In the O nitrogen plots the protein content was higher in Pasture A than B.

The clover contributions is clearly shown by the following table.

	Pasture A (Clover)	*Pasture B (No clover)*
Average green yield per acre from 0 nitrogen plots in 100 lb.	229	34
Average percentage in dry matter 1st cut	14·6	11·6
Average percentage protein in dry matter 2nd cut . . .	12·1	9·7

Federal Lucerne Trial

Yields this year were 33 per cent. higher than last year taking all plots into account. The top four varieties remained in the same relative position.

Variety	*Mean Air-Dry Weights per acre from three cuts* *tons*
S.A. Standard	3·10
Africa	2·86
Hairy Peruvian	2·71
Hunters River	2·62
New Mexico	2·31
De Puits	2·05
India	2·02
Caliverde	1·99

IRRIGATED PASTURES

The 1961/62 grazing season started in early August when ewes began "steaming up" on the 10½-acre H1 Rye Grass and clover pastures. Grazing days of cattle and sheep from then to the end of March, expressed as cow days, averaged 337 per acre, five sheep being taken as equivalent to one cow.

Root Crop Rotation

When pastures are re-established some difficulty has been experienced in obtaining a good seed-bed and also encroachment of Kikuyu from adjacent pastures has given some trouble. A rotation has been devised and was tried this year to help overcome this. A fifth of the area was sown to a root crop instead of grass during April. After these roots were harvested in September a cover crop of sunnhemp was sown and will be ploughed in during March. Then grass will once more be sown. Thus once in five years the ground will be rested from grazing, and it is hoped that this will improve soil structure and give a chance to clean the field. The first stage was successful this year. Swedes grew exceptionally well and cropped an estimated 36 tons of roots and eight tons of tops to the acre. Mangels did reasonably well but Japanese Radish, fodder beet and Kohl rabi were disappointing. The swedes provided a most useful succulent for the ewe flock.

VELD IMPROVEMENT

Kikuyu/Clover Introduction

Kikuyu and New Zealand Wild White Clover were introduced into natural veld after a hot burn in November. Phosphate and lime were broadcast on the ash. The grass was planted in lines 18 inches and 36 inches apart and the clover sown shortly afterwards. After the next rains it will be evident which grass spacing is the better. The clover was established most successfully where it was broadcast in plots that had both phosphate and lime, but without either of these little clover survived. Regrowth of veld grasses and shrubs was controlled by mowing.

Dahl (Cajanus Cajan) in Veld

Lines were ploughed at intervals of 12 feet in the veld. After lime and phosphate had been disced in, dahl was sown. A very promising establishment resulted. Unfortunately this was entirely destroyed by wild pig during April. If the pig problem is overcome, it is thought that the dahl will provide useful protein browse for cattle, and also increase the fertility from which the veld grasses will benefit.

Veld Burning and Mowing Trial

This has now been going for 14 years and the following preliminary observations have been made:

(1) The incidence of bare ground is twice as frequent in the burnt than in the mown plots.

(2) Increasing frequency of burning from triennially to annually leads to a decrease in the number of shrubs present.

(3) Shrubs are absent from mown plots.

(4) The mown plots contain grasses other than, and in addition to, broad-leafed *Eragrostis* and *Hyparrhenia* sp.

(5) In all but one mowing treatment, bracken *(Pteridium aquilinum)* is absent, whereas it is present in all burnt plots.

CROPS

Potatoes

Walanga, Loman and Up-to-Date planted in November yielded 76, 60 and 53 bags to the acre respectively.

Maize

Three varieties—51H37, SRH11, and 59H17 planted in November suffered damage from guinea fowl and wild pig. Yields were therefore difficult to measure. An estimate of the crop was 20 bags per acre.

Soya Beans

Varieties 135 and 147 were planted on a field scale in November. Nodulation was poor, possibly due to liming not having long enough to correct acidity. Buck grazed the area heavily and the crop was ploughed in.

PLANT INTRODUCTION

From nursery observation plots, the following introductions are of interest:

Horse Marmalade (*Desmodium discolour*).—This perennial legume grew well and carried a high proportion of leaf into the Spring.

Linseed (Linum usitatissimum).—Seven varieties grew well and produced a good seed crop. Some interest has been shown in this by a company concerned with vegetable oil extraction.

New Zealand Flax (Phormium tenax).—This fibre crop is growing well in both vlei and dry-land plots. If planting material becomes available a field scale trial will be planted this year.

Six North-African varieties of *Festuca arundinacae,* three varieties of *Paspalum notatum,* and *Shamva digitaria* were sown during the year.

HORTICULTURE

This work is carried out on the station under the supervision of Mr. O. H. Jones, the Advisory Horticulturist.

Deciduous Fruits

Eight apple varieties on Merton 793 and seedling root-stock have grown well. Pruning and treatment was the same as at Rhodes Inyanga Orchards. Insect pests were not troublesome.

Pear growth has been fair. Leaf-eating beetles were troublesome.

Peaches have grown well. Bud and grafting wood of early maturing canning varieties was distributed to local growers.

Soft Fruits

South African strawberry varieties have yielded well over a long period. Five raspberry varieties from Rhodes Inyanga Orchards were planted this season.

Coffee

Trees showed severe cold symptoms, and it is considered that this is due to the less favourable climatic conditions at this particular station.

Potato Fertilizer Trial

Up-to-Date yielded 171 bags per acre when a complete fertilizer, containing 900 lb. 19 per cent. superphosphates was applied. Where phosphates was omitted the yield was 45 bags per acre.

Vegetables

Three varieties of brussel sprouts were grown and samples sent for processing to the factory.

Cauliflower variety, American Snow Drift proved superior to Dutch Snow Drift, and 15-inch spacing gave the best yields.

Radish seeding trials showed that sowing prior to May gave the best results.

Broccoli variety trial yields are still to be calculated. Samples were sent for deep-freezing.

Development

A further eight acres has been added to the orchard and the irrigation furrow was extended to serve this area. After a fertility test crop of maize, fruit trees will be planted next winter. The trials will be designed to complement work at Rhodes Inyanga Orchards.

GATOOMA RESEARCH STATION

RAINFALL AND CROPS

The total seasonal rainfall at Gatooma from the 1st October, 1961, to the 30th April, 1962, was 27.61 inches, but distribution was poor, the main adverse features being two virtually rainless periods. The first of these occurred from the 7th December, 1961, to the 6th January, 1962, during which only 0.14 in. was recorded for the 31 days. The second period extended from the 23rd February to the 12 April, or 49 days inclusive, during which 0.42 in. fell in five small ineffective showers. On the other hand, moisture conditions tended to be excessive at times between the 7th January and 22nd February, when a total of 17.36 inches was recorded for the 47 days.

Planting of all main cotton trials and bulks, as well as of maize acreages for rations, was completed in good moisture conditions over the period 6th to 12th November, following which a number of variety trials of crops other than cotton were sown as follows: Maize and sorghum for Matopos and castor beans for Gatooma during the last week of November; groundnuts for Salisbury and a second maize trial for Matopos on the 6/7th December, and finally, a sunflower variety trial on the 9th January.

All crops in the early stages of development were visibly retarded by the very poor moisture conditions which prevailed towards the end of December and early in January. Cotton, castor beans, and groundnuts showed less stress than maize. Moreover the lack of rain during the March/April period accelerated the ripening of crops already set and also inhibited further crop-making in cotton and groundnuts.

Mean yields per acre of the main crops grown as bulks were, for maize, mostly Hybrid No. 11, 14 x 200 lb. bags grain, for Albar 637 cotton (sprayed), 2,555 lb. seed-cotton, and for Valencia groundnuts, 25 bags pods.

COTTON INSECT PESTS CONTROL

The information which follows has been obtained from the Cotton Pest Research Scheme's Annual Report for the 1961/62 season.

There was no change in the organization of the scheme from the previous season. The main centres of experimental work were Gatooma Research Station, Southern Rhodesia, and Chitala Experiment Station and Chikwawa, Nyasaland. Limited work was carried out at the Makanga Station in Nyasaland and at Sabi Valley Experiment Station in Southern Rhodesia. In Northern Rhodesia insecticide trials were conducted at Mount Makulu Research Station and at Magoye Experiment Farm.

The present term of the scheme is due to terminate in June, 1963, but an extension to June, 1965, is probable.

In May, 1962, Mr. D. J. McKinley joined the entomological team and he is now stationed in Nyasaland.

Dr. C. Cottrell is continuing to study diapause in *Diparopsis* at the University College of Rhodesia and Nyasaland, and the scheme has been able to co-operate in this work by supplying insect material.

BIOLOGICAL INVESTIGATIONS

Diparopsis Diapause Pupae and Moth Emergence

At Gatooma the period of moth emergence extended from November to March with the main emergence occurring during December, January and February. As in previous seasons the emergence remained uniformly high over the period mentioned, with no pronounced peak over a short period. 1.7 per cent. of the pupae remained alive in the soil at the end of the season, and these could give rise to moths which lay eggs in cotton planted in the second summer season following the formation of the pupae.

The Behaviour Response of Diparopsis and Heliothis to Cotton Varietal Differences

Preliminary work was carried out to assess behaviour responses such as plant attraction to egg-laying moths, larval movement and larval uptake of insecticide deposits, especially in relation to the degree of pubescence (hairiness) of different unland cotton varieties. First results, and these can only be regarded as tentative, indicate that:

(a) There is no reason to suppose that *Diparopsis* (Red bollworm) moths will show a preference for either glabrous (non-hairy) or pubescent cotton varieties for oviposition.

(b) when offered a choice *Heliothis* (American bollworm) moths show a distinct preference for the pubescent types of cotton, judged by the extent of oviposition.

(c) There appears to be little or no difference between the number of eggs laid on the different varieties tested, by either *Diparopsis* or *Heliothis* when no choice is offered.

(d) There are strong indications that insecticide control of *Diparopsis* may be more effective on pubescent rather than glabrous varieties of cotton, as a result of increased retention of insecticide deposits under rainfall conditions, and the prolonged movement of first instar larvae on pubescent varieties.

It is unlikely that these results will provide an alternative means of control of the two bollworms, and they could only be applied to modify a spray programme.

FIELD INSECTICIDE TRIALS

Insecticide Trial, Sprayed by Knapsack

The timing and relative effectiveness of different treatments involving sevin, D.D.T. and thiodan sprays were compared in similar trials at Gatooma, Chitala, Magoye and Mount Makulu. Each of the three insecticides was applied at 0.5 per cent. active ingredient in 5-30 gallons of spray per acre, depending on cotton plant growth. In addition, rogor was applied to control aphis when necessary, except in the thiodan and unsprayed plots.

Seven insecticide treatments, common to the four trials, inclusive of the one currently recommended to growers, all significantly outyielded the unsprayed control plots at Gatooma, Chitala and Magoye, but at Mount Makulu only three of the treatments inclusive of the present "commercial" one gave significant increases. Yield comparisons between the unsprayed and "commercial" treatments are:

	Locality of Trial			
Treatment	*Gatooma S.R.*	*Chitala Ny.*	*Magoye N.R.*	*Mount Makulu N.R.*
	Yields in lb. of seed-cotton per acre			
Weekly sprays, "Sevin" with changes to DDT as advised commercially . . .	1,811	2,090	2,149	1,500
Unsprayed	866	1,304	1,125	1,094
Increases in favour of spraying . . .	945	786	1,024	406

In these trials, the spray treatments, being a majority, probably afforded a fair degree of protection from pests to the unsprayed plots.

Tractor Spraying Trial

In this trial, Albar 637 cotton was planted and sprayed, according to published recommendations made to growers, by tractor. To do this, seven rows of cotton were alternated in strips with three rows of Valencia groundnuts along the length of a 480-yard field. This arrangement allowed the free passage of a Ferguson T.F. 20 tractor over the groundnuts, without harm to either crop while applying insecticidal sprays, to 3½ rows of cotton on either side of the tractor, through tailbooms mounted on a rig at the rear of the machine. The total acreage of the cotton was 5.08 acres while that of groundnuts was 1.42 acres.

A total of 14 sprays, six of them sevin and eight D.D.T., was applied according to recommendations. Rogor was added to four of the spray applications to control aphid. One of the fourteen sprays was applied by knapsack because of wet soil conditions, although later this was considered an unnecessary precaution. Insect attack, especially that of *Heliothis*, was high.

Yields of the two crops are shown in the following table, the cotton rows bordering on the groundnuts having been harvested separately to the others.

Mean yields lb. seed-cotton per acre			*Percentage Stained Cotton*	*Yield lb. Groundnut kernels per acre and bags + 180 lb. in brackets*
Cotton rows next to Groundnuts	*Inside Cotton Rows*	*All Rows of Cotton*		
3,020	2,375	2,555	0·07	685 lb. (3·8 bags)

The overall yield of the dry-land crop of cotton at 2,555 lb. Class "A" seed-cotton per acre, was most satisfactory, but that for the groundnuts was poor, namely 3.8 bags per acre. If the groundnuts are valued at 90s. per 180 lb. bag and the cotton at 8½d. per lb., the gross return per acre is £73 for the two crops. With production costs estimated at £27 per acre a net return of £46 per acre is obtained.

Cotton Extension Trial

For the second season in succession an extension insecticide trial sprayed by knapsacks with tailbooms was carried out in the Gatooma and Sabi areas of Southern Rhodesia and in the Southern and Central Provinces of Nyasaland. There was a total of 32 plots in Nyasaland and eight plots in Southern Rhodesia. Each plot had its sprayed and unsprayed sub-plots, the sprayed area being treated according to present recommendations.

Red bollworm occurred throughout the trial, but was most serious on the Salima Lake Shore. The major pest was American bollworm which was particularly severe and persistent in the Gatooma area, from early January to April with a peak in March.

In 31 out of the total 40 plots, yields in the sprayed sub-plots ranged between 1,000 and 2,400 lb. of seed-cotton per acre; and in the great majority of these plots yield increases due to spraying were of the order of 500 to 1,000 lb. of seed-cotton per acre. Where differences due to spraying were small or negative (this occurred in two instances) these could usually be related to faulty choice of land, or unfavourable agronomic practices, or spraying inexperience. Not unexpectedly, the plots which were closely supervized by Cotton Pest Research Staff on two farms near to the Gatooma Station, and on the station itself, gave consistently high yields and large differences in favour of spraying. As will be seen from the following table the mean difference in favour of spraying was 1,424 lb. seed-cotton per acre.

Plot Number	*Yields in lb. Seed Cotton per acre*			*Per cent. Stained Cotton*	
Gatooma Area	*Sprayed*	*Unsprayed*	*Differences*	*Sprayed*	*Unsprayed*
36 . . .	2,452	309	2,143	0·1	21·0
37 . . .	1,836	208	1,628	0·6	6·9
38 . . .	1,723	319	1,404	0·3	15·9
39 . . .	1,511	823	688	1·1	9·0
*40 . . .	2,196	1,247	949	2·2	9·6
Mean . .	1,941	517	1,424	0·9	11·6

* Supplementary irrigated; others dry-land.

SPRAYING EQUIPMENT

The tailboom is now recognized to be an essential feature common to all cotton-spraying systems. In 1961/62, tailbooms were fitted to knapsacks and also to the station's Ferguson tractor for the strip cropping experiment already described. In addition to further trial of this equipment in 1962/63, a number of other systems, recently developed, will be tested. Thus the tractor will be provided with cowling to reduce damage to cotton plants over which the machine will pass. There will also be a high-clearance sprayer equipped with spray tank and motor which will probably be drawn by oxen along the rows of cotton. Furthermore, two "Portable Line" systems, one low- and the other high-level, will be under trial. The portable line system consists essentially of a line of operators each of whom carries on his back a tailboom attached to a lightweight shoulder harness. The tailbooms are linked to each other, across the rows of cotton, by P.V.C. hosing, which also carries the spray liquid. The tailboom of the operator at one end of the line is connected by a long length of hosing to the spray pump mounted on a tractor or other suitable equipment which operates from the edge of the field. The low-level portable line system was first seen in use in cotton by a member of staff while on a visit to Arcadia Estates, Ntumeni, Natal, in 1962. With these alternative systems from which to choose, individual growers will probably be able to utilize one or more depending on which is most suitable to the slope of the lands, the labour force available, and prevailing soil moisture conditions, for spraying the cotton crop from the ground.

COTTON PLANT BREEDING AND AGRONOMY

Mr. F. E. M. Gillham, Plant Breeder, who left Gatooma in August, 1960, on study leave at North Carolina State College, U.S.A., is now expected to return to Gatooma in February, 1963. Meanwhile limited cotton breeding and expanded agronomy research programmes have been conducted by Mr. J. M. Burton, Agronomist.

Cotton District Variety Trials

Yield comparisons were made between Albar 637, the present commercial cotton variety, seven strains selected in 1958 from certain 1957 selections taken from Albar 627 and Albar 637, and G52/36 of U4 origin. The trial was conducted at four stations, namely Henderson, Gatooma, Sabi and Mount Makulu in 1961/62. Combining the yields, recorded as lint per plot, from the Gatooma and Henderson trials with six similar trials carried out in 1960/61, the results are shown in the following table from which it will be seen that there were no significant yield differences between the four 1958 Gatooma selections S58/81, S58/76, S58/74 and S58/83. However, these four selections produced significantly more lint per acre than Albar 637. In fact S58/81 yielded 94 lb. more lint per acre, or the equivalent of 280 lb. seed-cotton, than Albar 637. In turn Albar 637 significantly outyielded G52/36, one of the U4 strains which the Albar replaced in cultivation.

COTTON DISTRICT VARIETY TRIALS 1960/61, 1961/62
(Yields in lb. lint per acre)

S58/81	*S58/76*	*S58/74*	*S58/83*	*S57/135*	*S58/88*	*Albar 637*	*S58/252*	*G52/36*
719	708	696	690	688	672	625	570	550

P = ·5–35 lint per acre; P = ·1–45 lb. lint per acre; C.V. = 10·6 per cent.

Cotton Lint Tests

Small-scale spinning tests conducted on 1960/61 lint samples, at the Shirley Institute, Didsbury, Manchester, England, gave the following main results: Of the four strains S58/74, S58/76, S58/81 and S58/88, the S58/81 had the highest fibre and yarn strength followed by S58/88 and S58/76. Albar 637 gave a yarn strength lower than the average of the S58 material. Furthermore, unlike the previous two seasons, the irrigated samples were not always of a higher fibre maturity than the dry-land material.

In view of the yield and lint tests results, seed of the four S58 top-yielding strains is being bulked in 1962/63 with the objective of issuing one of the strains to supersede Albar 637.

Cotton Variety Trial

In yield comparisons between American varieties Arkott, Acala, Stoneville and Fox, Albar 637 and three Gatooma selections, one of these being S58/74, there were no statistically significant differences between the "Americans" and S58/74 which, as previously recorded, was one of the four highest-yielding strains in the District Variety Trial; but both Arkott and Acala yielded significantly more seed-cotton per acre than Albar 637. The difference was 115 lb. seed-cotton per acre in favour of Acala over Albar 637.

COTTON AGRONOMY

Cotton Fertilizer/Variety Trials

Two trials were planted, the one following a late-ploughed green-manure crop, Dhal, *Cajanus cajan,* and the second following maize, the stalks of which were ploughed under.

The fertilizer treatments in both trials were: N, as C.A.N., O, 40, and 80 lb. per acre; K_2O as muriate of potash 0, 45, and 90 lb. per acre. The plant spacing was 3 ft. x 9 in. x 1 plant. The varieties were: Albar, Acala and G52/36.

The mean yield of the trial following dhal was 2,126 lb. seed-cotton per acre, while that following maize yielded 1,698 lb. seed-cotton per acre. In both trials there were small but non-significant responses to nitrogen and potash fertilizers. In both trials, also, Albar 637 with a yield of 2,277 lb. seed-cotton per acre after the dhal, and 1,971 lb. seed-cotton per acre following the maize, significantly outyielded Acala and G52/36 at the 1 per cent. level.

Cotton Fertilizer/Spacing Trials

Two trials were planted, with Albar 637, the one at Gatooma Station, under dry-land conditions, the second at Kanyemba Farm, Umsweswe, under supplementary irrigation.

Treatments in both trials were: N, as C.A.N., 0, 50 and 100 lb. per acre; K_2O as muriate of potash, 0, 45 and 90 lb. per acre. The spacings were 15 in., 9 in. and 6 in. between plants in the row and 3 ft. 6 in. between rows.

In the dry-land trial the mean yield was 1,981 lb. seed-cotton per acre, and in the supplementary irrigated trial the mean yield was 3,111 lb. seed-cotton per acre.

Under dry-land conditions, 50 lb. N per acre produced 154 lb. seed-cotton per acre more than the 0 lb. N per acre treatment, and 90 lb. K_2O per acre gave an increase of 141 lb. seed-cotton per acre over 0 lb. K per acre, both results being significant at the 1 per cent. level.

In the supplementary irrigation trial, 100 lb. N per acre produced 529 lb. seed-cotton per acre more than the 0 lb. N per acre, a significant result at the 1 per cent. level, and although 45 lb. K_2O per acre increased yield by 239 lb. seed-cotton per acre over 0 lb. K_2O per acre, this result was not significant.

In both dry-land and irrigated trials, there were no significant differences between the three spacings. Nevertheless the order of yield was 15 in. (highest), 9 in., and 6 in. between plants in the row.

Cotton Spacing Trials

A range of spacings between rows as well as in the row were compared in two trials planted at the Gatooma Station. Under the conditions of the season, a spacing of 3 ft. between rows produced the highest yield in both trials. In the one trial 3 ft. x 15 in. gave 1,837 lb. seed-cotton per acre, and in a second trial 3 ft. x 18 in. produced 2,011 lb. seed-cotton per acre. Neither of these results was statistically significant over all others. Certain yield trends were that, between rows there was a slight advantage in the 3 ft. over the 3 ft. 6 in. spacing, but both of these proved better than a 4 ft. 2 in. spacing; and it also appeared that the in-the-row-spacing between plants should not be reduced much below 9 in. and possibly this could be increased to 15 in. or even 18 in. x 2 or x 3 plants per station. Termite damage, if more than very light, would probably reduce yield appreciably with the wider 15 in. or 18 in. spacings between plants in the row.

Fertilizer Methods of Application

There were no significant differences between treatments in comparisons between (a) fertilizer side-banded by hand; (b) fertilizer broadcast by machine; and (c) no fertilizer. The mean yield of the three treatments was 1,742 lb. seed-cotton per acre and differences between the two methods of fertilizer application and no fertilizer were 130 to 140 lb. seed-cotton per acre.

AGRONOMY: CROPS OTHER THAN COTTON

Crop Production Trial

This trial, which occupies between four and five acres, is arranged for the Division of Chemistry. The objectives are to assess the productivity of six different crop rotations, some of which include cotton, on both the physical and chemical properties of the soil. Treatments involving the crop rotations, disposal of plant residues and fertilizer applications have been reported previously. Some of the main yield results, which are not comparable statistically, obtained in 1961/62, the third year of the trial, were:

(a) The mean yield of maize was 13.3 bags grain per acre and of cotton 1,945 lb. seed-cotton per acre. These results compare with 28 bags and 2,875 lb. seed-cotton per acre obtained in 1960/61.

(b) Cotton following maize gave a mean yield of 2,117 lb. seed-cotton per acre with a 96 per cent. plant stand in contrast with 1,773 lb. seed-cotton per acre with a 77 per cent. plant stand when the cotton followed dhal.

(c) Comparing applications to cotton of 100 and 50 lb. N per acre, the 100 lb. N resulted in higher yields of seed-cotton per acre, so that, when the cotton followed maize an increase of 297 lb. seed-cotton per acre was obtained, and after dhal the increase was 121 lb. seed-cotton per acre.

(d) Cotton which received the 100 and 50 lb. N per acre applications and which followed maize produced more seed-cotton per acre when the maize stalks were ploughed back compared with the treatment in which the stalks were removed from the land.

(e) The mean yield of maize from all plots, whether this crop followed cotton, maize, or dhal was 12.7 bags grain per acre, the greatest difference between treatment means being 1.7 bags per acre. The 12.7 bags may be compared with 27 bags from similar treatments in 1960/61.

Sulphur Trial

This trial, now in its third year, is being conducted for the Division of Chemistry. Gypsum treatments are 0; 100; and 200 lb. per acre in a crop rotation of legume (sunnhemp), cotton and maize. The overall yield of maize in 1961/62 was 13.8 bags grain per acre. There were no significant differences between treatments.

Maize Cob-rot Trials

Two such trials, now in their third year, were continued for the Division of Plant Pathology.

In Trial I, in which only maize is planted, three levels of nitrogen in different treatments, i.e. 0, 50 and 100 lb. N per acre, as urea, were applied to the crop, the "trash" being removed from certain plots (="clean") and ploughed back (="trash") in others.

The mean yield of the trial was 16 bags grain per acre. The 100 lb. N per acre treatment, whether applied to "clean" or "trash" plots, gave mean yields of 17.6 bags grain per acre. This result was 4.5 bags per acre higher than the 0 lb. N per acre "clean" treatment.

In Trial II, treatments are (i) maize-maize, (ii) maize-dhal and (iii) dhal-maize. As the trial consists of phased rotations detailed analysis will be made when there are sufficient data. In 1961/62 the yield of maize following maize was 16.2 bags grain per acre and maize following dhal produced 15.1 bags.

Sunflower Variety Trial

Of the six varieties of sunflowers, Short Russian, Jupiter, Mars, Ella (all of approximately 120 days maturity), Universal and Comet (about 110 days maturity), the Short Russian produced 10.9 x 125 lb. bags seed per acre, which result was significant in yield over the other five varieties at the 1 per cent. level. However, the crude protein in Short Russian seed was 3.5 to 5 per cent. less than in the others.

Castor Bean Variety Trials

Four varieties namely Cimaron Original, Hybrid 6, Hybrid Cimaron and Hybrid Nebraska were compared for yield in two separate trials, one of which received two applications of DDT emulsifiable liquid at a concentration of 0.5 per cent. active ingredient, and at a rate of 20-25 gallons of spray per acre. The trials were situated approximately 1½ miles apart.

In both trials Cimaron Original gave the highest yield, this variety being very much less variable for plant type and also better in plant stand than the other three. The yields of Cimaron Original were 2,433 and 1,658 lb. beans per acre in the sprayed and unsprayed trials respectively—a difference of 775 lb. beans per acre in favour of the crop sprayed with DDT.

Crop Variety Trials for other Stations

These included:

1. A maize trial, planted in duplicate one "earlier" and the other "later" for Matopos. In this trial 11 Salisbury-bred varieties were compared with 14 others, one of which was AWF x K64r, the white flint variety bred at Matopos. The mean yield of the trial planted on the 24th November, 1961, was 22.2 bags per acre, while that sown on the 6th December produced 17.7 bags per acre. In general the Salisbury varieties gave the better yields in the "earlier" trial but this trend was reversed in the "later" trial.

2. A trial containing 25 sorghum varieties for Matopos. The mean yield of this trial was 20 bags grain per acre. Top-yielders were Hybrids NK 300 and NK 320, the former producing as much as 40 bags per acre.

3. A groundnut trial, for Salisbury, in which 25 Natal Common and 24 Valencia types were compared. The mean yield of the trial was 24.6 bags (x 65 lb.) pods per acre, and of the six highest yielders Natal Common types occupied the first five places. The highest yield was 35.6 bags pods per acre.

4. A seed multiplacation plot of about half an acre of Arens sorghum was also grown for Matopos. This yielded at the rate of 18.7 (x 200 lb.) bags grain per acre.

5. Three Salisbury maize varieties and the AWF x K64r variety from Matopos were each planted in three-acre plots, in the same land under comparable bulk-plot conditions. Yields in bags per acre, shown in the brackets, were: 59H17 (22), No. 13 (18), No. 11 (15), Matopos AWF x K64r (12).

COTTON PRODUCTION

Seed for Planting: 1962/63

For the third year in succession the Officer-in-Charge, Gatooma Research Station, organized the order of ginning of the 1962 crop, and also the processing and issuing of acid-delinted cotton-seed for planting in 1962/63.

Mr. A. A. K. Rhodes, Technical Assistant, Cotton Pest Research Scheme, was engaged and accepted responsibility, while on vacation leave, for processing the seed for planting. A fast-deteriorating, ten-year-old plant was efficiently maintained and the rate of production was increased appreciably, to meet the greatly expanded demand by farmers in Southern and Northern Rhodesia for seed for planting.

A total of some 216,000 lb. of seed was issued to growers for planting in 1962/63 compared with approximately 25,000 lb. in 1961/62 and 70,000 lb. in 1960/61.

From the 216,000 lb. of seed, it is estimated that approximately 10,000 acres of cotton could be grown in the 1962/63 season.

On a weight basis, 85 per cent. of the seed was ordered by growers in Southern Rhodesia and 15 per cent. by growers in Northern Rhodesia. Within Southern Rhodesia, 96 per cent. of the seed went to European-owned farms, situated predominantly in the middle-veld, and the remaining 4 per cent. went to African farmers in the Sabi Valley. Furthermore, European growers in the Gatooma area ordered 38 per cent. of the seed; followed by the Mazoe Valley, 19 per cent.; Banket, 12 per cent.; and Hartley, 8 per cent. Of the total 15 per cent. planting seed issued to Northern Rhodesia, African and European growers each took approximately 50 per cent.

The 1962 Crop

The total number of bales of lint (x 400 lb.) ginned in 1962 was 1,387, which is 1,189 bales less than in 1961. Sabi Tanganda Estates, formerly a large-scale producer, did not grow cotton in 1962. Approximately 38 per cent. of the 1962 production was grown in the Sabi-Lundi lowveld areas, of which about 25 per cent. was produced largely under irrigation. The remainder of the crop, namely some 62 per cent., was grown mainly under dry-land conditions in middle veld areas of the Rhodesias.

In 1962, Class "A" seed-cotton accounted for 79 per cent. of the total crop, Class "B" for 11 per cent. and Class "C" for 10 per cent.

GRASSLANDS RESEARCH STATION

The Grasslands Research Station, at Marandellas, serves the agriculture of some 12½ million acres of sandy country in north-eastern Southern Rhodesia, where the rainfall is usually sufficient, and sufficiently reliable, for arable farming without irrigation.

Within its means the station deals with all aspects of the agriculture of its region except tobacco, and with this crop it works by offering its facilities and co-operation to the Tobacco Research Board of Rhodesia and Nyasaland.

As its main task the station is seeking means of maintaining and raising soil productivity. It is believed that the sandy soils of the region, once brought into cultivation, can best be preserved for continuing agricultural use by some system of ley farming, and much of the work of the station derives from this belief. Such a system, however, has little application in African agriculture at present, so emphasis is being shifted to study of other means of maintaining productivity.

The station covers some 6,750 acres. It has an European staff of 17 and an African staff of 16.

Notable features of the past year were the decision of the Agricultural Research Council of Rhodesia and Nyasaland to establish a research team at Grasslands to reinforce the station's study of soil productivity, the creation of two more posts—one for animal research and one for legume-inoculant production, the building of a factory for inoculant-production and a glasshouse for legume research, a major advance in the winter feeding of beef cattle, and extension of piped water to the African housing areas.

WEATHER

The rainy season was marked by a very severe drought which lasted for 34 days from December 7th to January 9th. Otherwise, rainfall for the year was satisfactory and ended only 4.33 in. below average at 31.99 in. The winter was mild and sunny, with 57 frosts.

Crops generally made a remarkable recovery from the drought, but maize remained stunted and yielded poorly, and yields of mid-season grass silage were poor. Livestock flourished, apparently favoured by the generally warm weather in both summer and winter.

EXPERIMENTAL WORK

Forty-five experiments, involving some 3,450 plots, 720 animal-periods and 4,000 analyses and tests, were done during the year.

Legumes

In view of the need to grow more protein-rich food for both man and beast and in view of the potential importance of groundnuts and soya beans, study of legumes now has first call on the station's resources.

A glasshouse for the chemical and microbiological laboratories was built towards the end of the year, and arrangements for fitting it with a temperature-regulating plant are being made. This should do much to increase the effectiveness of study of legume nutrition.

The collecting and testing of strains of the legume bacteria *(Rhizobium)* continued throughout the year, with special attention to soya beans, lucerne and garden peas and beans. The *Rhizobium* collection now contains 482 strains derived from 157 species of legumes, and another 560 isolates await test.

A good deal of experimental work was done in working out production methods for the new legume inoculant factory.

Over 200 varieties of groundnuts were under test, and five of them, despite the mid-season drought, gave over 1,700 lb. of shelled nuts per acre. Some 180 varieties of soya beans were collected for trial next season.

About 80 varieties and species of legumes were grown in the search for forage and pasture plants. Of these, *Teramnus uncinatus*, a close relative of the soya bean, is well to the fore at present.

Grasses

Grasses, as the basis of the station's work with leys, receive much attention, and study of their culture and use was continued.

Some 120 selected grasses have been under test in the search for productive, free-seeding, nematode-resistant forms that will withstand heavy summer grazing. Certain species of *Paspalum* look like meeting these requirements.

To provide an informed basis for local grassland management a series of studies of the effects of defoliation is being made. This year, with Sabi Panicum, it was found that the amount of root under grass cut monthly throughout the growing season was, at the end of the season (in May), only 66 per cent. of that under uncut grass. In both cases the proportion of available carbohydrate in the roots fell till about the middle of the growing season and rose again thereafter, but the rise was the less in the case of the grass cut monthly.

Studies of Sabi Panicum for use as foggage have shown that more and better forage is to be had by cutting the foggage and feeding it as hay than is to be had by grazing it *in situ*. It has also been shown that the best time to close fields intended for foggage is early January.

For the fourth season running Sabi Panicum grown in 3 ft. rows outyielded that grown as a close sward. In a new and parallel study, however, no such difference has appeared.

Thirty-six varieties of cereals, grown under irrigation in winter, were compared as fodder.

Leys

Seven experiments to assess the effects of leys and ley-management on soil productivity were continued, and one of them was test-cropped with maize and tobacco. As was the case with a previous experiment, it was found that the greater the amount of nitrogenous fertilizer that had gone on the grass the greater was the yield of the following crop of maize. This effect, however, was small and was readily obscured by applying nitrogenous fertilizer to the maize itself. It was found also that the yield of maize was a little greater where the grass had been grazed than where it had been hayed.

The test-crop of tobacco was grown in co-operation with the Tobacco Research Board and will be reported by them in due course.

Livestock

Fourteen experiments with livestock were done during the year, and were concerned mainly with the use of local feeds for beef and dairy cattle and sheep.

The cause of many disappointments in feeding protein-supplements in winter to steers subsisting on coarse roughage appears to have been uncovered during the year—the cause appears to have been the misassumption that such roughage will provide all the animals' energy-requirements and that only the protein-deficiency need be made good. The tables below summarize the results of two experiments in which maize-meal was added to rations consisting of coarse roughage and a protein supplement—in both cases the response to the protein-supplement was adequate only when maize-meal was added.

TABLE I

GAIN OF AFRIKANDER WEANERS SUBSISTING ON SABI PANICUM FOGGAGE HAY AND RECEIVING VARIOUS SUPPLEMENTS

(in lb. per head per day from July 19th to October 5th)

Experiment 360		*Carbohydrate Supplement*	
		0	*2 lb. maize meal per head per day*
Protein supplement	0	0·13 lb.	0·20 lb.
	2 lb. groundnut meal per head per day	0·61 lb.	1·01 lb.

TABLE II

GAIN OF AFRIKANDER YEARLINGS SUBSISTING ON SABI PANICUM FOGGAGE AND RECEIVING VARIOUS SUPPLEMENTS

(in lb. per head per day from June 13th to October 3rd)

Experiment 356		*Carbohydrate Supplement*	
		0	*1 lb. maize meal per head per day*
Protein supplement	0	0·10 lb.	0·13 lb.
	20 lb. oat soilage per head per day	0·61 lb.	0·97 lb.

It has been found that three-year-old steers on burned veld grazing can be well finished for sale in February if they are given 2 lb. of crushed maize a day from the beginning of October.

It has been found that when beef weaners and yearlings are well fed in pens in winter they gain less than their unfed contemporaries during the following summer on veld. This makes such feeding unprofitable at present prices and with present knowledge.

Study of the use of irrigated oats soilage for milking cows has shown that it may be used to replace conventional concentrates (18-20 per cent. C.P.), provided that 1 lb. of maize-meal is added for each gallon of milk produced.

For the fourth winter running dairy heifers grazing maize stover gained nearly 1 lb. a day—provided they also received about 20 lb. of grass silage a day.

Veld and Vlei

Six experiments comprising studies of veld-management systems, effects of burning, effects of prolonged overgrazing, methods of killing trees and coppice, and the drainage properties of clay tiles in vlei land were continued.

The Chemistry Laboratory

Some 3,000 samples were analyzed in the Chemistry Laboratory during the year, most of them being herbage and dung samples analyzed for their content of nitrogen.

Analysis of tree-roots to learn of seasonal trends in their reserves of carbohydrates has shown that M'sasa roots *(Brachystegia),* for example, may contain as much as 37 per cent. of available carbohydrate—a surprisingly large amount and an amount which goes far to explain their resistence to destruction.

EXTENSION

About 1,100 visitors, including 50 African farmers, were recorded during the year.

In addition to the numerous talks and lectures given to visitors to the station, thirty-two more were given in the districts, twenty-one special advisory visits were made and nine judges were provided for shows and ploughing matches. Twenty-three committee meetings and public functions were attended.

Nearly 150 samples of seed and over 200 bags of grass roots were dispatched locally and to ten foreign countries. Some 500 cultures of *Rhizobium* were provided to other stations and laboratories and for experimental plantings by Conservation Officers and farmers.

A small factory for the production of legume-inoculants has been built and is being equipped for an output of 50,000 cultures a season.

Five papers and articles were published during the year.

DOMESTIC MATTERS

Staff

Changes of staff involving three posts occurred during the year. Two new posts, one for an Animal Husbandry Research Officer and one for a Legume Inoculant Production Officer, were created and the latter has been filled.

Officers were on vacation leave for 394 days, occasional leave for 86 days, sick leave for 63 days, study leave for 13 days, and on military service for nine days. Nine conferences were attended by four officers.

The Officer-in-Charge visited South Africa in May and attended a short course at the University College of Rhodesia and Nyasaland during the same month. Legume Inoculant Production Officer was given a month's bacteriological training at the Harare Hospital during August.

Farm Cropping

In the station's arable rotation there were, during the year, some 360 acres of planted grassland, 71 acres of maize, 20 acres of soya beans, 70 acres of compound allotments, and 20 acres of fallow. In addition there were 29 acres of irrigated pastures. Yields, as a result of the long mid-season drought, were below average for the station.

Farm Livestock

The station's livestock included 467 beef cattle, 92 dairy cattle and 157 sheep at the end of the year.

In the dairy herd the average output of milk for all lactations completed during the year was 10,191 lb. per 300-day lactation, with an average butterfat content of 3.79 per cent.

Seventy weaner-steers were bought and 134 sold on graziers' agreements with the Cold Storage Commission of Southern Rhodesia.

Revenue from the sale of meat and milk amounted to £7,521 for the year ended 30th June, 1962.

Twenty-five ewes were transferred to the Henderson Research Station in December, and two Mashona bull-calves were sent to the progeny-testing trial at Makaholi Experimental Farm.

Estate

Buildings, roads and fences were maintained and developed as usual, and the station's management of its timber was put on a planned footing.

A start was made in piping water to the African housing areas.

African Welfare

The station's African school, filled to capacity, had 132 pupils at the end of the year, 59 of them being boys and 73 girls. Appreciation is due to Canon S. M. Wood for his supervision during the year.

ACKNOWLEDGEMENTS

The Farmers' Co-op., Salisbury, very generously donated one thousand guineas to help equip the new legume inoculant factory and to further research with legumes.

Very generous gifts of fertilizers were received from Messrs. Fisons (Rhodesia) Ltd., Messrs. Windmill Fertilizers (Rhodesia) Ltd., and Messrs. African Explosives and Chemical Industries (Rhodesia) Ltd.

HENDERSON RESEARCH STATION

GENERAL

Locality and Rainfall

The Henderson Research Station lies in the centre of the maize-growing area of Mashonaland, and comprises in the main a variety of rich loam soils and, typically also of the region, a section of granite hills with sandy soils of various types at their base.

In the current year good early rains fell, followed by an exceptionally dry December. The station itself was fortunate in that the crops were not damaged at that time on account of a few local showers. The rains continued well into the late autumn and crops and pastures were good. The total rainfall for the year was 41.96 inches.

Staff

Throughout the year the staff was up to strength, but due to shortage of housing one professional and one clerical officer have lived away from the station. With the start of the new financial year a number of new posts were approved as a result of the decision to develop experimental work on cash crops alternative to white maize (Burley tobacco, fibres, yellow maize, soya beans, sunflowers). In addition, much needed professional assistance was afforded in the pasture and animal husbandry sections, and technical assistance with the biochemical analyses of feeds, rumen contents, faeces and urine. In all four additional professional officers and three technical assistants were scheduled to work on the station in the course of the year, and arrangements have been made to provide the necessary transport, office and research facilities for them.

Today the staff posts comprise 14 professional officers (including two conservation research officers and one African agriculture research officer), two administrative officers, 15 non-professional officers (including one conservation technical assistant), 18 Branch III and Branch IV African staff (including two from Conservation) and 150 general farm workers. One African meteorological recorder is stationed here.

In the course of the year three officers of the station worked on Doctorate Theses in the fields of erosion control and animal nutrition. It is hoped that in the coming year or so a start will be made to put together the results of the past ten years of research in pastures, fisheries and field husbandry.

Farm Development

Considerable improvements have been made to road surfacing, drainage and firebreaks and tree planting has been extended. On the 300-acre farm unit further fencing and field layout has been carried out, and the dairy has been redesigned. The African farming studies are being developed apace and the programme should be in full swing in the coming rainy season.

Two new houses and one cottage were built by the Public Works Department. Plans are being drawn up for a further 12 cottages in a village for Branch III and Branch IV African staff. The assembly hall and amphi-theatre was in regular use by groups of visitors for lectures and discussions. The Scientific Society held ten meetings and membership of the society has increased appreciably.

Irrigation

The river, as a result of continued expansion of irrigated land upstream, is no longer able to furnish the water needed for the winter experiments. A plan to recirculate the seppage water from the fish ponds has been found to be impracticable and there is clearly no alternative but to construct a 150 million gallon dam in the catchment area above.

Acknowledgements

Generous grants of fertilizers were received from Messrs. Fisons and Rodia in the past year. These have given most essential and valuable elbow room to research in the management, nutritional, rotation and seed production fields where large areas of pastures and crops are needed. These gifts are gratefully acknowledged.

Visitors and Advisory Visits

During the year the officer-in-charge gave 57 lectures to senior boys and girls in high schools in Northern and Southern Rhodesia on the need for university graduates in agriculture. He and the staff were called on to give many lectures and addresses in Northern and Southern Rhodesia throughout the year.

The numbers of visitors coming singly and in groups have been great, and the need for a public relations officer to deal with them is becoming more and more acutely felt.

Increasingly, groups of Africans are making day visits to the station, and there is a real need for overnight accommodation for them. Often Africans come from distant farms and it is impossible for them to return to their homes on the same day. The interest and enthusiasm shown by these groups in the work in progress is very encouraging.

GENERAL NOTES ON RESEARCH OBJECTIVES

The Henderson Research Sation is engaged in research which is designed to support the stated objectives of the Federal Ministry of Agriculture and particularly those connected with the ecological area served by the station.

Concurrently with this, the station is exploring the problems associated with the improvement of conditions in the African-farmed land by furnishing detailed experience and knowledge of—

(a) methods of achieving an "abundant subsistence" for all agriculturally based families in tribal and native purchase areas;

(b) ways of elaborating methods of production which with a necessarily small monetary investment per worker will contrive a level of production sufficient to bring in some profit on money committed, and also allow of capital formation.

With these desiderata in mind, work is being spear-pointed towards the techniques and philosophies of low-cost home supplies of piped water, home watered gardens for vegetables and fruit for the family, and forage for fowls, rabbits and other small stock; dry-land crops and pastures for sheep and cattle primarily for home use; and finally, low cash and high labour demanding crop and livestock production régimes for the cash economy.

Although this work relating to small-scale African farming conditions has only recently started, information and new thoughts are pouring out on which it is hoped a new, confident, productive and capital-forming rural community can develop in the great stretches of land which have not progressed with the times, and indeed insofar as soil and natural resources are concerned, have deteriorated over the past 50 years.

FISHERIES RESEARCH CENTRE

Staff

In January, 1962, the staff position was bettered by the appointment of a Fisheries Officer in the person of Mr. D. Cumming, a graduate of Rhodes University.

Fisheries Research Centre — Ponds, Buildings, etc.

During the year outlet sluices in breeding ponds were constructed, fencing extended and repairs to pond walls and slopes carried out. Finishing touches were put to a great deal of minor constructional works. Buildings and installations are in excellent condititon and only general maintenance, painting, etc., were required. An aeration system and partial heating were installed in the aquarium.

Library

The library is being slowly built up into a useful reference collection of literature on fisheries, and this is due in no small measure to wider contacts with fisheries institutions and their generosity. Commercial Fisheries Review and Sport Fishery Abstracts are received regularly through the generosity of the Agricultural Attaché to the American Consulate.

Visitors

During the year visitors to the centre included individual farmers and groups of farmers, schools, young farmers' clubs, personnel from the University College, Museum and other bodies. His Excellency the Governor-General, Lord Dalhousie, and the British High Commissioner, Lord Alport, paid short visits in May and June, 1962.

Extension, Development and Education

A course of lectures and practical demonstrations was arranged for second year students from Gwebi Agricultural College. Demonstrations, lectures and addresses were given to I.C.A. and farmers' associations and similar bodies in Matabeleland, Umtali area, Mtoko, Wedza, Macheke and locally.

An exhibit at the Salisbury Agricultural Show had "Fish Smoking" as its theme. Pamphlets were prepared and were available on the stand which was attended by officers from the centre who were able to answer many questions.

A large number of advisory visits were made in connexion with the development of pond culture, dam exploitation and commercial and sporting fisheries. Papers for the Rhodesia Agricultural Journal and popular journals were prepared covering gill netting, fish smoking, pond construction, etc.

Research on Molluscicides, Tilapia and Carp

During the course of the year several investigations in conjunction with the Bilharzia Research Laboratory were made into the toxicity of molluscicides to fish.

A research project on a farm dam to investigate hydrobiological characteristics before and after treatment with molluscicides is being operated jointly with the same body. It is expected that a considerable amount of information on growth, population and other items will emerge from it.

During the year experiments on the production of Tilapia under monosex culture showed encouraging results. The method of sexing was laborious and trials on early sexing using length as an indication for male fish will have to be carried out.

Low rates of stocking under moderate feeding and using bass as a control fish reduced yields, but led to larger percentages of bigger fish. The role of bass in controlling population has been disappointing in small well-fertilized ponds.

Experiments comparing Tilapia and Carp in the colder high-veld areas show the superiority of Carp both from the point of view of total production and individual size.

Experimental results point to the effectiveness of stocking at low rates in production ponds for the rapid attainment of marketable size Carp. Large shallow ponds with good natural fertility give the best response. The results of spawning have been somewhat disappointing as smaller numbers of fry than expected are obtained. This does not appear to be a result of localized edaphic factors.

The growth rate of Carp has in most cases exceeded expectations and the problem that remains is to put this to the best advantage by the most economic means. Predation by otters, birds and in the young stages by crabs is a factor adversely affecting rearing. The green manuring of rearing and production ponds is proving useful and further investigations on this are to be carried out.

Other Fish

Studies of the biology and production of *Serranochromis* are possible now that breeding stocks have been received. Small mouth and spotted bass are being reared for studies on acclimatization in suitable waters. Trout have been reared successfully to yearlings and the intention is to use them for evolving types better adapted to warmer waters.

Hydrobiological Research and Surveys

Surveys and investigations were in progress during the year on the following lakes: Lake McIlwaine, Mazoe Dam, Lake Sebakwe, Ngesi Dam, Umfuli River and Fern Valley Lake.

Information on fish biology and potential and general limnology is being obtained and is providing a base for management.

During the year work was done on Whitewaters, Gwenoro, Cleveland Dam and a number of other angling waters.

General Development

Without resident staff in a number of areas it is difficult to maintain impetus and interest. Visits are made as frequently as possible to areas which show promise. Intensive production in ponds is increasing slowly and interest in dam production in some areas is mounting. There is great scope for development in the African areas to which some attention was given this year. Carp production appears to be a field which may provide an important section of fish production particularly in areas unsuitable for Tilapia. Marketing is a subject that will require attention.

Information is being collected slowly on ways and means of developing sporting and commercial fisheries on the larger lakes.

Fry Production

The spawning of bass in 1961 was very satisfactory and over 15,000 were disposed of. Some 5,000 were despatched to Kyle Dam. Fry for stocking were delivered in amounts above average.

THE 300-ACRE INTENSIVE FARM UNIT

The production of milk has risen steadily over the past years, from 36,742 gallons in 1960 and 45,532 in 1961 to 53,397 gallons in 1962 (1st October, 1961 to 30th September, 1962). Production of maize grain was slightly less (1,220 bags in 1961 and 1,194 bags in 1962). The average yield per acre was 37 bags. The silage crop was similar to that of the previous year, namely 850 tons. Concentrates fed (including home-grown maize) were 124 tons in the current year as compared with 109 tons in 1961. Every effort is being made to feed more maize and to reduce the amounts of protein feeds purchased. The growing of some 25 acres of perennial legumes for silage and autumn grazing is on the future programme, replacing the grass ley in the crop rotation. The costs of production of milk and maize have not yet been worked out, but it is anticipated that the net profit on the enterprise will be not less than last year, in the region of £2,000 from a gross product of some £10,000. The hoped-for increases in gross production (as a means of lowering costs per gallon) were not realized on account of an outbreak of Redwater in the wet autumn, at a time when reconstruction was in progress and when 22 unacclimatized Friesland cows were brought in, in exchange for an equal number of Jerseys. Some 10,000 gallons of milk were lost in 15 potential lactations as a result. These animals are now acclimatized and doing well.

The new kraal and fencing plans are now in operation and machine milking in an enlarged dairy has replaced the hand milking in the old overcrowded byre, with considerable savings in labour and improvement in times and efficiency of milking procedures. In the coming year it is intended that the herd will be increased further from 100 cows to about 110, and that production per cow will rise also. The number of heifers to be reared will be reduced. It is hoped that progress along these lines will lead to a much-needed reduction of costs per gallon of milk sold. To meet this situation more fertilizers will be used on the summer pastures, legume and grass leys, and on the crops. It is hoped that costs per unit of product will be substantially reduced. Steps are being taken to reduce the amounts of purchased concentrates per gallon of milk produced, by a more efficient use of the summer herbage and by a more liberal use of maize grain and early cut maize silage in winter.

The appointment of a European learner assistant to the manager has been approved.

The labour force has remained at 14, but it is hoped that with increasing efficiency and understanding it will be possible to reduce the numbers and pay higher wages.

PASTURE RESEARCH SECTION

The research programme is designed to cover two separate aspects of agriculture in the higher-rainfall region of the country. Firstly, pasture farming in the fertile soils is being investigated against a background of maize production and secondly, problems of small-scale intensive farming on granite sands are being explored.

Pasture Farming in Fertile Soils

The use of pasture products to provide satisfactory planes of nutrition for various classes of livestock is being explored to determine to what extent vleis, veld and planted pastures, together with fodder crops, can provide the nutritional needs of beef and dairy animals. To achieve this, the complete pasture, crop and livestock husbandry pattern is under consideration.

Weaner Production Forage Sequence

The feed requirements for high-calving percentages and weaning weights from cows calving in both spring and autumn can be met by using vleis for early spring grazing, fertilized sown pastures for summer grazing and summer rested veld to supply winter roughage.

Under this arrangement, with the aid of a winter protein supplement for the cows due to calve in spring, two acres vlei, two acres veld and one acre of pasture were sufficient to provide the annual needs of one cow and her calf. Under this stocking rate the swards were stable, and at the same time regular calving and satisfactory weaner weights were obtained.

Beef Production Forage Sequence

Forage sources for raising beef weaners to slaughter weight continue to receive attention. Where summer grazing is provided by sown pastures, one acre provides 210 grazing days of such a quality that the animals are ready for a finishing feed period at the age of 18 months. Following on this feeding period Rhodesia's best gradings were obtained for the animals which were marketed under two years of age in spring.

The use of feed systems which increase the slaughter age to meet alternative seasonal markets can impose additional pressures on the feed supply and severely limit production per acre. To overcome this problem the possibility of reducing the slaughter age to 18 months is being investigated. In this respect a cheaply produced diet of corn, cob and husk meal together with legume silage has an important role in producing rapid winter gains after weaning. The good carrying capacity and quality of sown grasses are utilized for summer grazing and the animal can be fattened during autumn on protein rich perennial legume pastures.

Forage Sequence for Summer Milk Production

Studies of the seasonal production of milk continue with particular attention to the feeding of maize meal during the grazing period. Cows receiving 5 lb. meal daily in addition to pasture grazing, produced 480 gallons milk in 235 days and increased 219 lb. in bodyweight.

Further improvement of production is aimed at by using perennial legume pastures for autumn grazing. A more precise definition of the need for carbohydrates to balance the available protein level is being sought.

Perennial Legumes

Desmodium intortum and *D. discolor* are being used to give silage and protein-rich grazing in autumn. Preliminary results indicate that either species can be successfully established in cover crops of maize or annual legumes after these have received their last cultivation. *Desmodium intortum* established in this manner and cut twice for silage in the following season, yielded 22.92 tons of green herbage per acre. When the aftermath growth was grazed in autumn after a January silage cut yielding 16.48 tons green herbage, this legume provided 180 grazing days of 3½ hours each day to supplement grass pasturage.

It is clear that for silage purposes *Desmodium discolor* should be cut before the stems become too coarse. To achieve this, three successive cuts on November 24th, January 17th and March 24th were necessary. These cuts yielded 2.52, 4.29

and 4.79 tons green herbage per acre respectively. Further, it is apparent that the growth after the two early silage cuts provides better grazing for autumn than the plants which have reached maturity.

Veld which had been rested throughout the summer produced 1.81 tons of dry matter per acre and this, supplemented with protein, provided satisfactory grazing in winter for beef breeding cows and slaughter stock. The results of current efforts to supply protein by dahl browsing show that hedge-rows of this legume can be established in dense stands of *Hyparrhenia* species. In this past winter, the body weights of weaner steers were maintained in a field where each animal had access to .25 acre dahl and 1.2 acres veld.

The Future

It is clear that protein and carbohydrate-rich crops and pastures can be grown efficiently in this region and that these, together with the available vleis and veld, can provide highly nutritious feed for a much larger number of animals than is currently realized.

The work has shown that feed from various sources can be combined in ways which will meet the requirements of several classes of livestock and make possible a considerable expansion of the livestock industry.

Further work is needed to increase the efficiency of the feed sequence by reducing feed, labour and machinery costs. In this programme particular attention will be paid to perennial legumes, the selection and improvement of suitable grasses for permanent pastures and the use of high producing, carbohydrate-rich crops.

RESEARCH INTO SMALL-SCALE INTENSIVE FARMING ON GRANITE SANDS

This programme is designed to explore the problems of small-scale intensive farming on granitic sands and to elaborate farming systems which are practical and economic and maintain the health of the soil.

Small-scale Intensive Unit

As a first step, a practical assessment is being made of the potential of a simple farming system similar to that recommended to African farmers in the Chinamora Reserve. A unit of land, 80 acres in extent, has been selected and developed with well, cottage, farm buildings, fencing, etc., and equipped with animal-draught implements to approximate the basic needs of an average African reserve farmer's holding. This area comprises 20 acres of riverine vlei soil, 20 acres of well-drained deep sandy arable soil and 40 acres of rough and steep granite veld grazing.

Within the 20 acres of arable land, a crop rotation which includes maize, small grains, legumes and fallow is being followed on 14 acres, and Turkish tobacco is grown on one-half acre of land which is stumped each year in the veld grazing area. Residues and by-products from cash cropping on the arable land, together with vlei and veld grazing, are used to maintain two draught oxen, three Manguni cows and 12 ewes.

Apart from proportions of grain and animal products which are retained for farm use, a farm vegetable garden, orchard, poultry and rabbits are being kept to provide the farmer's subsistence requirements.

The work is controlled by a professional officer in order to standardize management practices as much as possible. Guidance is given by a committee of management which includes an accountant, an economist, two African farmers, two members of the Southern Rhodesia Division of Agriculture and two members of the Federal Department of Research and Specialist Services.

From an informed chemical, physical, mechanical and economic appraisal of the system it is anticipated that underlying problems will become apparent and that the best approaches to their solution will be clarified.

Already it is becoming increasingly clear that alternative uses of capital, labour and resources should also be explored in other systems which specialize *either* in animal *or* crop production so that a comparison can be made with the diversified system which is currently advocated. Further, there is a need to determine to what extent community centre facilities should be developed to provide farms within walking distance, with such services as ploughing on contract, consumer goods, cold storage, milk handling, co-operatives and so on.

To obtain information in these fields, collateral trials have been established adjacent to the 80-acre unit.

The Livestock Trial

An area of 60 acres comprising 20 acres riverine vlei, 20 acres arable land and 20 acres veld grazing has been developed with fencing, water, roads, buildings, etc., during the past season.

A small area of fodder crops, together with perennial grass and legumes will be grown in a 10-year rotation on the arable land. This feed, in addition to improved vlei and veld grazing, will be used to provide dairy cows with a high plane of nutrition.

The Cropping Trial

To approximate the area under crops on the 80-acre unit, 14 acres of land have been cleared, levelled and protected with conservation works.

During the coming season a seven-year rotation which includes a selection of grain, legume, fibre, tobacco and oil crops will be established to ascertain the production from each, together with their respective labour, capital and machinery requirements.

The Future

From the simple start which has been made into problems of crop, animal and diversified farming systems appropriate to small-scale intensive units, it is proposed over the next two or three years to bring each system to its highest potential through experience and manipulation. Once this has been achieved and viable units have been formulated and rigorously tested, the systems will be applied on government demonstration farms and in due course extended to larger areas comprising groups of farms in Native purchase areas and reserves.

The supplementary work on African farming has been made possible by a generous grant of $10,000 from the Rockefeller Foundation, which is gratefully acknowledged.

ANIMAL HUSBANDRY

The Senior Animal Husbandry Officer was awarded a Rockefeller Research Fellowship in Animal Science on 1st March, 1962, granting him three years of study leave to attend the Department of Agriculture of the University College of Rhodesia and Nyasaland. Since this time considerable progress has been made in the more detailed investigations into protein metabolism in ruminants.

The work is showing that the amount of protein which animals need for health, growth and production can be greatly reduced by a knowledgeable manipulation of the carbohydrate fractions of the diet. Protein is the most expensive and most difficult fraction to supply in the sub-tropics, particularly during the long dry periods, and there is reason to suspect that great quantities of this valuable material are most wastefully consumed and returned to the soil in the wet summers, and that correspondingly great quantities of stored protein are no less wastefully fed to high-producing cows and beef animals in the winter. The amounts and types of fatty acids produced in the rumen as end products of carbohydrate digestion have a profound influence on overall energy metabolism and in addition on such types of production as butterfat and solids—non-fats in milk.

The production of these intermediary substances—that is fatty acids—appears to be profoundly affected by protein feeding which can be critical both as regards quantity and quality *vis-a-vis* the quantity and quality of the energy fractions of the diet.

The implications of this protein study are turning out to be far wider than was originally expected and work is proceeding, using the normal digestion crates for cattle and sheep, rumen content sampling and analysis from fistulated ruminants, and artificial digestion studies of rumen contents in the Henderson laboratories.

The application of these biochemical techniques has been made possible by the close collaboration and generous assistance of the University College of Rhodesia and Nyasaland, Department of Agriculture.

DRY-LAND AND IRRIGATED CROPS

Over the past year, high yields of maize, groundnuts, cotton, soya beans, burley tobacco, winter wheat, barley, lucerne, potatoes, beans, peas and onions were obtained. The sunflower, castor bean, cauliflower, tomato and lettuce crops were disappointing as a result of pests, diseases, climatic factors and unsuitable seed.

Dry-land Experiments

Maize yields were up to 41.0 bags per acre on the rotation experiment where the ninth crop of continuous maize produced a yield of 37.1 bags per acre. Once again large responses to nitrogen were recorded. For example, continuous maize which received 100 lb. nitrogen produced 34.2 bags, while an extra 50 lb. nitrogen gave a yield of 37.1 bags per acre. In a cotton fertilizer/spacing experiment the responses to nitrogen and spacing (6, 9 or 12 inches in the row) were not significant. However, the responses to phosphate were significant and were as follows: O, 40, 80 P_2O_5 per acre produced 1,945, 2,298 and 2,477 lb. seed-cotton per acre respectively. Groundnuts responded well to early planting, a gypsum top-dressing, innoculation and an insecticide application at planting. The variety Makulu Red planted on 20th November, 1961, produced up to 2,693 lb. shelled kernels per acre.

Soya beans yielded 11.2 bags and burley tobacco 1,400-1,600 lb. per acre. Weed-killer experiments were initiated on groundnuts, soya beans, sunflowers and castor beans and will require further study. Sunflower and castor bean yields were disappointing at 1,400 lb. seed and 174 lb. shelled beans per acre respectively.

A start was made, later in 1962, with new programmes of work on burley tobacco, fibre research and yellow maize breeding.

Irrigation Experiments

The results from pea seed production experiments confirmed that April was the best time of planting. In pea fertilizer experiments, further responses to increased phosphate applications were recorded while a depressing effect of nitrogen on yields of pea seed was noticeable. The yields were as follows:

	lb. seed per acre		*lb. per acre*
No nitrogen	1,946	No phosphate	1,347
15 lb. N per acre	1,869	60 lb. P_2O_5 per acre	1,852
30 lb. N per acre	1,732	120 lb. P_2O_5 per acre	2,349

For the second year in succession a seed rate of 160 lb. per acre gave slightly better yields than 120 or 200 lb. per acre, while 7-inch spacing yielded better than 14-inch spacing for the third season running. Variety Meteor again outyielded both the other varieties tested (Onward and Feltham First).

The absence of insects (mainly lesser army worms) resulted in insignificant differences in the yields of the pea insecticide experiment.

The nitrogen and inoculant experiment showed a depressing effect of nitrogen on pea seed yields and no effect from the inoculant. After one more season of water duty studies it should be possible to make firm recommendations on the water requirements of peas.

Twenty-one *pea bean* varieties turned out to be 21 varieties of *peas*. As the samples were very small and differed in the amount of seed, not even proper observation trials could be run. The seed, therefore, was bulked up for future trials.

As opposed to peas, beans responded to higher applications of nitrogen and closer spacing as follows:

	lb. seed per acre		*lb. seed per acre*
No nitrogen	1,280	No phosphate	1,419
25 lb. N per acre	1,533	25 lb. P_2O_5 per acre	1,474
50 lb. N per acre	1,622	50 lb. P_2O_5 per acre	1,543

Spacing	*lb. per acre*
12 in. between rows	1,797
18 in. between rows	1,446
24 in. between rows	1,193

Once again a dieldrin seed dressing depressed the yields of beans when compared with aldrin, endrin and no seed treatment.

An observation trial of 12 varieties of beans (mostly white seeded) gave very interesting results:

	lb. seed per acre		*lb. seed per acre*
Contender	1,374	Selecta	1,075
Black Valentine	1,371	Top Crop	859
Red Canadian Wonder	1,338	Michigan Pea Bean	811
White Processor	1,291	Tender White C	672
Imuna	1,190	Double Dutch Princess	646
White Canadian Wonder	1,105	White Wax	622

Of the 12 varieties tested White Wax, Michigan Pea Bean, Double Dutch Princess and Tender White were most affected by rust, in that order.

The onion time of planting experiment did not give as much information as had been expected. All three plantings (15th and 29th March, 12th April) of Early Cape Flat yielded almost identically (21,229 lb./acre, 21,359 lb./acre and 21,229 lb./acre respectively).

The number of bolters decreased considerably with later plantings:

	bolters per acre
15th March	42,199
29th March	26,706
12th April	20,613

The variety Texas Grano, for the second year in succession, performed very badly. It did not produce proper bulbs and therefore was difficult to cure. Most plants had thick necks and all had poor keeping qualities. Out of 11 new onion introductions from the United States of America, three varieties, Dessex Hybrid, Yellow Granex and White Alama performed very well and will be investigated further. The White Alama variety does not appear to be as good a keeper as the other two. Dessex Hybrid appears to be most promising on account of yield, uniformity of size of bulbs, general appearance and early and easy ripening.

Water duty experiments are being continued with Cape Flat and Yellow Granex at three different nitrogen levels.

The tomato fertilizer experiment was a failure due to "bushy top" and eelworm infestation. The former disease was most probably due to burley tobacco being grown in the vicinity of tomatoes. The latter was due to a rapid build up of nematodes in a red clover/rye grass ley which proceeded the tomatoes.

The cauliflower fertilizer experiment was a failure due to bad seed which was imported from the United States of America by a reputable seed firm. The seed apparently was raised without adequate certification and the resultant plants reverted to parent material such as kale, rape and cauliflowers.

A detailed lettuce fertilizer and method of harvesting experiment failed due to an untimely frost which reduced the crop drastically.

Wheat yields were in the region of 20 bags per acre with suitable varieties and adequate fertilizing. The main response in the wheat fertilizer experiment was to nitrogen with slight responses to the lower levels of phosphate and potash. The application of O, 40 and 80 lb. nitrogen per acre produced 10.0, 15.3 and 19.6 bags per acre respectively. The six-row barley variety Atlas (California ex Sabi) produced 26.0 bags of grain, while the best two-row variety available (B14 Domen) produced 17.5 bags per acre. Barley planted on 10th April, 25th April and 10th May produced 15.6, 25.1 and 24.5 bags per acre respectively, which demonstrated the importance of time of planting.

Lucerne plot yields were disappointing as compared with field scale plantings. This was most probably due to frequent trampling and inspection (often in wet conditions) of small plots and close hand cutting as compared with judicious management and mechanical cutting of large-scale plantings. Potatoes continued to produce good yields when planted in July-August, but difficulty has been experienced in controlling blight in the March crop. Fungicide trials have been started in an effort to overcome this problem.

Future work on the Agronomy Section will aim at producing high yields of all crops being investigated. It is proposed to increase the emphasis on solving the basic problems of disease and pests; the introduction of new varieties; water duty and irrigation efficiency studies, and the supplementary irrigation of crops.

MATOPOS RESEARCH STATION

(Including Nyamandhlovu and Tuli Stations)

INTRODUCTION

Staff

Twelve vacancies occurred during the year and of these all but three have been filled.

Housing

The housing position is satisfactory at present, with one new house being built. The Ministry of Works redecorated four houses during the year and commenced work on another three.

Native Beer Hall and School

These continue to run satisfactorily but the numbers of children attending the school have had to be limited to those residing on Rhodes Matopos Estate.

African Compound

Eight married quarters for African labourers are being built in the compound by the Ministry of Works and are nearly completed.

Crops

Rainfall for the season was lower than average (19.02 in.) but the distribution was such that exceptionally good crops were reaped. Seven hundred tons of maize silage, 7,150 bales of bean hay (141 tons) and 791 bags of maize were reaped.

Bilharzia Campaign

Bilharzia control in the Matopos North I.C.A. has been taken over by the Research Branch of the Ministry of Health. Using Bayer 73 to eliminate snails, they report that initial results are exceedingly promising. All Africans on the station have been treated with nilodon. This affected most of them badly and a large part of the labour force was unfit for work for several days.

General

A large number of farmers' days, conferences and meetings were attended by members of the staff, and many advisory visits were made. Numerous visitors, including several from overseas, were conducted round the station. These included groups of farmers, Conservation and Extension Officers, students and research workers.

Veld fires were numerous this year and many were obviously caused deliberately. An effective fireguarding system coupled with prompt action by the staff has limited the areas burnt to about 2,000 acres, however.

ANIMAL HUSBANDRY SECTION

There is ample evidence to prove that in the marginal rainfall areas little or no progress has been made in increasing the production of beef by means of grading the indigenous stock to Africander or British beef bulls.

From a practical beef production point of view farmers are thus in the difficult position of deciding whether they should continue breeding from imported stock or select for higher production from within their existing herds.

This problem is further complicated by the fact that no exact experimental evidence seems to be available to indicate whether the imported breeds can be maintained economicaly on locally produced fodders.

In order to obtain some information on this important aspect of livestock improvement, large-scale breeding trials were started on this station in 1957.

For the purpose of this investigation two closed herds of grade Africander cattle are being selected for increased production on free range and under conditions of winter feeding. At the same time two lots of registered Africander cows are being bred to imported bulls of the same breed to determine to what extent they differ in production from the locally selected stock.

The data presented in Table I clearly shows the differences which may be expected in production between the two systems of cattle rearing.

TABLE I

FED CATTLE

Breed	*Calving Percentage*	*Age at Slaughter (years)*	*Carcass Weight*	*Carcass Grade (Per cent.)*				
				R.B.	*Imp.*	*Std. A*	*G.A.Q.*	*F.A.Q.*
Grades . . .	81	2½	576	59·7	29·9	9·1	1·3	—
Pure-breds . .	75	2½	527	26·3	47·4	26·3	—	—
RANGE CATTLE								
Grades . . .	61	4½	527	—	—	56·3	31·3	12·5
Pure-breds . .	61	4½	517	—	—	50·0	50·0	—

From an animal breeding point of view it is evident that the progeny of the locally bred bulls are as good as, if not better than, those of the imported sires. This experiment is being continued to determine whether this level of production can be maintained through judicious in-breeding.

From an economic point of view and excluding capital investments the annual cost of wintering cattle seems to vary around £5 per head. The steers were finally fattened at roughly £10 per head, so that the total feed costs for marketing animals at 2½ years amounted to approximately £20 per steer. The fed bullocks were sold at an average of £46 as compared with £28 for the range bullocks. When it is considered that under conditions of winter feeding calving rates may be increased by 20 per cent., it is obvious that in the lower-rainfall areas this system of stock rearing offers great possibilities for increasing the production of beef at reasonable costs.

In order further to reduce feed costs intensive studies are in progress to determine how the natural grazing can best be supplemented to obtain maximum animal growth.

Cattle Feeding Trials

From a purely nutritional point of view animal growth in the marginal-rainfall areas is limited mainly by a deficiency of protein in the winter grazing.

To determine the value of urea as a protein substitute four groups of steers were fed urea and cotton-seed meal during the 1961 winter. At the beginning of the 1962 dry season the animals were fed a concentrate ration. The urea and cotton-seed meal was fed at the rate of 3 oz. and 1¼ lb. per steer per day respectively.

The following results were obtained:

TABLE II

Treatment	*Initial Weight*	*Weight Nov., 1961*	*Weight Sept., 1962*
Control	482	457	826
Urea	482	480	819
Urea and Maize-meal	482	480	838
Cottonseed Meal	480	549	872

From the results presented in Table II it can be seen that the animals fed urea, singly or in combination with maize-meal, maintained weight in winter. However, as conditions of nutrition became favourable the animals on veld grazing caught up in weight with those which received the urea supplement. On the other hand, the animals which received cotton-seed meal maintained their advantage in weight over the remaining three groups.

Mutton Production

The selection of smooth-coated sheep from Dorset Horn x Blackhead Persian crosses was continued. The flock now consists of a high proportion of smooth-cated animals with a desirable mutton conformation.

The effect of different levels of protein supplementation on the milk production of ewes and the growth of their lambs is being investigated.

Also, the sheep are being used in digestion trials to determine the nutritive value of the natural pastures on the three main soil types in this area.

FIELD HUSBANDRY SECTION

The season, which showed an overall shortage of rainfall with drought periods, was very interesting because of the effects of the season on different soil types and on different crops. The heavier soils, because of their greater water-holding capacity, were able to support crop growth for longer periods than the lighter soils. This was especially true of the shallow-rooted crops on sandveld, such as groundnuts, which suffered severely from drought and yielded less than half the 1960/61 yields. The crops on the clay soils hardly suffered from drought and yields were only 20 per cent. down on 1960/61 figures. Also in this season the shorter-growing-season crops and varieties yielded far better than the longer-maturing crops and varieties. In a season such as this which was a fairly typical Matabeleland season, the yield of sorghum grain compared to maize on heavy soil was more than double, while on sandveld millet silage yielded 50 per cent. more than maize silage.

Dry-land Agronomy

On the granite sandveld at Matopos a response was obtained to phosphorous on the maize nitrogen, phosphorous, spacing trial but there was no response to populations.

In sorghum population trials (conducted at Matopos, Nyamandhlovu, Tjolotjo and Tuli) seed rates were again used for the in-row spacing. In addition the seed used was floated and sieved to ensure it was of good quality. The responses obtained under different conditions were rather confused, but it appears that 18 in. between rows x 15 lb. of seed per acre will be about optimum.

In groundnut trials there was no significant difference in total yield of Valencia and Natal Common, but Valencia gave a higher proportion of confectionary-grade nuts. In this season the closest spacings (12 in. x 2 in.) and the widest spacings (36 in. x 6 in.) gave a depression in yield. The optimum spacing in a season like this would appear to be 18 in. x 3 in. The varieties selected from observation plots in 1960/61 were grown in trials at Matopos and Tjolotjo in comparison with Natal Common and Valencia. There were very small differences in yield and none of the varieties significantly outyielded Natal Common or Valencia.

Once again lodging was the main problem in the sorghum and millet silage trials. Yields of sorghum silage on the clay soil were double those of maize, while on the sand millet outyielded maize by 50 per cent. The sorghum silage spacing-seed rate trials gave little indication of the correct spacing or seed rate, except to indicate that closer rows appear best. Owing to staff shortages at planting time, no work was planned on hay crops.

A sunflower trial was planted to compare six varieties, two between-row spacings and two in-row spacings. No differences were obtained between varieties, although the level of yield at 16 bags per acre was promising. Spacings indicated that populations of 20,000 to 29,000 plants per acre would be optimum.

Sorghum variety trials once again showed the outstanding performance of two hybrids produced in South Africa, NK 300 and NK 320. NK 300 came out at the top in all trials, and gave yields of 40 bags per acre at Matopos and Gatooma. (The top maize yield in variety trials was 16 and 27 bags per acre respectively.) NK 320, where tested, did as well as NK 300, but being a taller variety it is not so well suited to grain production. In spite of the excellent performance of these hybrids, some of the open-pollinated Feterita and Hegari sorghums gave yields in excess of 30 bags per acre. Of the three "S" grade sorghums Framida proved to be the best variety.

Maize variety trials showed, at all centres except Gatooma, the better performance of the quicker-maturing hybrids. Varieties which did well were NPP x K64r, SA 11, PP x K64r, SA 4, SA 5, AWF x K64r. At Gatooma the Salisbury material performed better than in Matabeleland although it did not outyield some of those listed above. The very poor performance of S.R. Hybrid 13 in Matabeleland shows that there is a need for quick-maturing varieties, as the tendency in Mashonaland is for each new variety to be longer maturing than previous varieties.

Irrigation Agronomy

The supplementary irrigated maize nitrogen, phosphorous, spacing trial received 11.7 in. of irrigation in addition to 12.03 in. of rain. The increase of yield was only from 20 to 24 bags per acre. The only response obtained was to nitrogen, which gave a linear response, no nitrogen giving 19 bags per acre and 500 lb. per acre of calcium ammonium nitrate giving 28 bags per acre.

A potato seed size /seed rate trial gave a very good yield of 230 bags per acre. There were no significant differences in total yield, but yield of table potatoes was significantly better using "table" and seed-size potatoes for seed. The most interesting fact was that using seed rates from 10 to 20 bags per acre gave no differences in either total yield or yield of table potatoes.

Work was started on a lucerne moisture trial on sandveld. This trial, which is being recorded in minute detail, is yielding very interesting information on the response of lucerne to different moisture régimes. Two attempts were made to plant lucerne variety and lucerne seed rate/spacing trials, but both had to be abandoned due to poor germination and excessive weeds.

Soil Moisture Studies

The programme of soil moisture studies was again continued, and although some progress has been made with back data, a lot of work still remains to be done.

Plant Breeding

The Matopos topcross AWF x K64r was planted on a number of farms throughout Matabeleland and reports from the farmers are very favourable. The Seed Maize Association has, after protracted negotiation, agreed to produce this cross commercially and the first seed will be available for the 1963/64 season.

Crop Ecology

A joint trial in conjunction with Sabi Valley Experiment Station on the growth analysis of maize and sorghum was conducted. Unfortunately, once again this work has not been analyzed and there is a lot of data now accumulated. An attempt was made to control the season length of sorghum by covering it towards the end of the season with a polythene sheet. Unfortunately, owing to lack of money, the structure could not be made as secure as desired and the aftermath of one of the cyclones blew the sheet to pieces. A preliminary study of the workings of floating lysimeters was started during the year.

PASTURE RESEARCH SECTION

Veld Management

Cattle running in the veld management trials wintered well at all three stations during the 1960/61 dry season but some difficulty was experienced during the current winter. At Matopos supplementary feeding recently became necessary in all groups in the four paddock, three herd trial on *Hyparrhenia* sandveld. It is likely that this will also be necessary in other trials before the rainy season. At Tuli extreme poverty made necessary the removal of steers from stocking rates of 1:10 and 1:15 in the two paddock, one herd trial and from stocking rates of 1:10, 1:15 and 1:20 in the three paddock, one herd trial.

The stocking rate trials again proved interesting. At Matopos it was again shown that on sandveld dominated by *Hyparrhenia filipendula* the performance of the grazing animal during the dry season is little affected by stocking rate. Animals run at actual stocking rates of 1:14 doing very little better than those run at 1:4.

(N.B. The term "actual" stocking rate refers to the acreage per animal actually available for grazing during any one year. Thus, in a four-paddock, three-herd system of management, where a quarter of the area is reserved for burning each year, the "actual" stocking rate is three-quarters of the "overall" stocking rate.) The reason for this appears to be that the cattle graze antheaps and other "sweet" areas as far as possible and as a result the *Hyaparrhenia* which is ungrazed during summer becomes rank and unpalatable. On other veld types this has not been the case, and in most cases animal performance during both the growing and the dry seasons has been significantly better as stocking rates have increased. This is particularly marked at Tuli.

Vegetation changes are becoming apparent at Matopos on the red soils where actual stocking rates are in excess of 1:7½. On sandveld, on the other hand, although grass vigour is affected by heavy grazing, little in the way of botanical change has been noted. Results at Nyamandhlovu are similar but it can be expected that when the trials have run for a longer period the critical stocking rate will be higher. At Tuli this point is in the neighbourhood of 1:15-20.

Winter Supplementation

The series of winter management trials on black soil at Nyamandhlovu will conclude this year. Small amounts of groundnut meal and self-feed urea supplements have produced maintenance. On the Matopos red soils, 3½-year-old cattle receiving 2 lb. cotton-seed meal per head per day have gained weight at a winter stocking rate of 1:1½. It is likely, however, that before the rains set in these groups will run short of dry matter, but those run at 1:2 will maintain weight.

The bush silage fed to steers at Tuli during the 1961 dry season failed to benefit steers and the animals lost as much weight as the control group running on the veld.

Bush Control Experiments

Burning.—The burning experiments at Matopos were re-analyzed using a charting method devised on the station, and the results are being prepared for publication. These confirm that burning too frequently or at the wrong time causes deterioration of the veld, but that a good fire once in four years just prior to the onset of the rains not only controls bush encroachment but maintains the sward in good condition. Similar results were obtained at Nyamandhlovu but at Tuli there was again insufficient grass to burn.

Chemical Control.—No new trials were started at Matopos during the year, but at Nyamandhlovu good results are being obtained with 245T and dieseline. The ammonium sulphamate trial at Tuli on *Colophospermum mopane* was a failure and a new trial, using 245T, has been started.

Handclearing.—Various ways of using hand labour with and without poisons were tried out over 75 acres at Nyamandhlovu. A knowledge of the woody species present, their habit and susceptibility to hand methods was shown to be important. The use of poisons greatly increases costs of operations. At Tuli a large ring barking trial has been initiated but no results are yet available. At Matopos the large-scale clearing trial continues and costs did not differ materially from those quoted last year.

Control through the Use of Goats.—Goats continue to show promise at Matopos and Tuli as agents to eradicate bush. Their value is increased when used in conjunction with fire.

Plant Succession Experiments

These experiments continue to show the extreme sensitivity of the red soils at Matopos and Nyamandhlovu to overstocking and continuous summer grazing. These treatments cause perennial grasses to be replaced by annuals and hasten encroachment by *Acacia* spp. On the Matopos sandveld, however, *Digitaria pentzii* still persists and is the dominant grass after 15 years of heavy grazing.

Veld Fertilizer Experiments

Experiments in which the natural grassland on three soil types receives up to 1,200 lb. of nitrogenous fertilizer per acre have continued. This year, all plots in a treatment were harvested when ready, i.e. when most of their grasses were in early flower. On all three soils dry matter yields increased as the amount of fertilizer applied was increased up to 600 lb. per acre, but yields decreased as more fertilizer was applied up to 1,200 lb. per acre. The decline was very marked on black soil. In spite of the decline, yields on all soils were greater from fertilized plots than from the controls.

Three new experiments were started during the year, in which natural grassland receives various amounts of nitrolime and superphosphate in summer, and is harvested during the dry season. The same design is repeated on black, red and sandveld soils. The application of nitrolime increased dry-matter yields considerably on sandveld and black soil, but had no effect on red soil. There was a slight response to superphosphate on sandveld but none on black or red soil.

Dry-land Pastures

No work with dry-land pastures was done except for the establishment of a stand of sorgrass. This is reported to be a useful and drought-resistant grass, and it certainly weathered the mid-season drought very well although barely past the seedling stage at the time. This grass warrants further study.

Irrigated Pastures

One lucerne trial continued. This mainly concerns applications of superphosphate and potassium chloride, responses to which varied from nil to highly significant throughout the year. In general, there is little to be gained by applying either fertilizer in excess of 800 lb. per acre and 200 lb. per acre is apparently too little. From an acre of non-experimental lucerne a total of 19,900 lb. of hay was produced.

A preliminary study of effects of height-of-cutting and interval-between-harvests on oats is still in progress. No comment can be made on the results obtained so far, but valuable experience has been gained with the techniques involved in this type of work.

Thirty-four varieties of oats were grown to bulk up seed for future work, and to take note of their growth-habits.

POULTRY SECTION

Research

The breeding programme received a serious set-back due to the outbreak of contagious respiratory disease. This may necessitate the slaughtering of all stock and also the destruction of the genetic material so far used.

The Effect of Dubbing (removal of combs and wattles) on Egg Production

Four teams of 12 Light Sussex New Hampshire pullets were housed in individual wire cages and fed the same mash for 3 x 28-day periods.

Team A served as control.
Team B wattles removed.
Team C combs removed.
Team D combs and wattles removed.

Results are illustrated in the following table:

FOOD CONSUMPTION, EGG PRODUCTION AND FOOD CONVERSION OVER 84 DAYS

Team	*No. of Eggs*	*Food Consumed*	*Food Conversion (lb. per doz. eggs)*
A	783	289·50	4·45
B	812	295·50	4·32
C	835	296·50	4·35
D	704	283·50	4·87

From the above table it appears that the removal of either the comb or the wattles has a beneficial effect on egg production and increased food conversion. The removal of both comb and wattles under conditions of this test appear to suppress feed efficiency and lower egg production. However, no conclusion can definitely be drawn until further trials are carried out over a longer period of time.

Advisory Work

During the year, 129 farms were visited and 77 farmers visited the section. Numerous letters and telephone calls were received; a number of farmers' meetings were attended and two lectures were given.

In general, farmers suffered a set-back due to over-production of table birds which resulted in lowered prices to producers, and in many cases farmers could not even sell. Egg prices fluctuated between 1s. 6d. to 5s. 6d. per standard dozen.

RHODES INYANGA ORCHARDS

INTRODUCTION

The station is situated in the centre of the Inyanga fruit-growing area, on 450 acres of granite soil with doleritic influences, at a height of 5,700 to 6,200 ft. The land is leased from the Federal Department of National Parks, and comprises a section of the farm, Fruitfield, at one time owned by Cecil Rhodes, which ultimately became the Inyanga National Park. A further ten acres of land close to the Mare Dam have been lent by the Park for potato and soft fruit work.

It would be impossible to select a site anywhere in the higher-rainfall areas of the Eastern Districts which could be considered typical, but Rhodes Inyanga Orchards is reasonably similar to a large portion of the Inyanga fruit-growing area. Other parts of Inyanga have either higher or lower rainfall, and rather different temperature conditions, though soils are of similar derivation. Since a series of substations is currently impossible, fruit (and vegetable) work is to be extended at the Melsetter station, and this will probably be complemented by small-scale trials on individual farms. Growers in the Inyanga district have expressed a keen desire for the latter, and it is hoped that something of the kind will be initiated in 1963. Plantings of both pome and stone fruits at Inyanga have been extended considerably in the past winter.

Early in 1959 a committee was formed to enable Eastern Districts growers to become more intimately associated with the work of the station. Initially, two, and later three growers, Messrs. B. C. N. Mountain, A. Pickup and J. Y. C. Thomson served on what became known as the Rhodes Inyanga Orchards Growers' Liaison Committee, the other members being officers of the Ministry whose duties bring them into close contact with the station. The committee met once only during the year, a second meeting planned for September being postponed because of a national emergency.

The present staff comprises two full-time and one part-time officers, and a casual labour force of about 25 Africans, supplemented as required by gangs of male and female labourers, who at times have brought the total up to 50 during the last year.

CLIMATE

Right through the rainy season until mid-March the rainfall was only about two-thirds of the annual average for the last ten years, although sunshine figures were not markedly higher than usual except for December, when 230 hours were recorded (compared with an average of 164).

On 15th and 16th March, cyclone "Kate" hit Inyanga, precipitating 6.83 in. and 3.78 in. rain on the two days respectively. Anemometer records for these two days show total runs of 215 and 218 miles—really very ordinary winds; and one can only account for the extensive local damage to plantation trees as resulting from short, sharp gusts working on trees heavily weighed down by rain-soaked foliage. Damage to fruit trees at the station was slight. No broken branches were seen and only a few fruits (late apples) were blown off. No erosion took place on the recently-ploughed experimental area.

Had it not been for the cyclone, the total rainfall for the season would have been well below 40 in. In fact, 40.60 in. was recorded at the packing shed—almost nine inches below the 10-year average. At the new meteorological site, only a quarter of a mile away, 49.14 in. fell. It will be interesting to see whether such a very great difference is maintained in future years. At the Mare Dam potato land the gauge overflowed during the cyclone, but an annual total of not less than 53.50 in. was recorded.

Sunshine records show that during the dry season both June and September were far sunnier than the corresponding months in previous years since the instrument was installed in 1955.

Partly because of the absence of "guti" weather and partly because of very low winds, day temperatures tended to be rather high and night temperatures rather lower in the early part of the winter. The average maximum for June was 66°F. compared with a 10-year average of 60.4°F., and in the same month 22 ground frosts were recorded, ten more than normal.

A continuous thermograph record was not maintained at the packing shed, but at the new site only 536 hours at or below 45°F. were recorded. This probably corresponds to about 800 hours at the old (packing shed) screen, and is a distinctly low chilling value for this station (c.f. 1953 with 1,326 hours).

Daily runs of wind exceeded 300 miles on 13 occasions, and on 16th October, 9th July and 15th September exceeded 400 miles. The highest recorded run was of 443 miles on 9th July.

Examination of wind direction records which are taken five times a day, confirmed that the new *Pinus patula* windbreak was correctly sited north-east to south-west. For the whole year 64 per cent. of recorded winds (i.e. during the hours of daylight) were from directions 90° to 170° inclusive. Only during the months of January and February was the percentage lower than 50, and during these months there was a higher than usual proportion from 270° to 350°. Winds from 360° to 80° only amounted to 11 per cent. of the whole, supporting the contention that a north-west to south-east orientated windbreak would serve little purpose.

It now seems possible that a Dines anemograph may be installed at the station by the Federal Meteorological Department in the reasonably near future. Apart from giving detailed information on gusts and calms, this instrument will give figures for the hours of darkness, about which we can only guess at the moment.

Hail fell at the station on 28th and 29th October, but was not of sufficient size, intensity or duration to cause serious damage.

In October, officers of the Chemistry Branch installed gypsum blocks for the measurement of soil moisture in one of the old orchards. Examination of apple-tree roots in four pits in a neighbouring orchard showed that comparatively few roots penetrated to a depth of more than 18 in. to 24 in. However, this may not be the case with a vigorous root-stock such as Merton 793, and moisture records are being taken down to 36 in.

Theoretical moisture losses from trees will also be available since the installation by the Division of Irrigation of an evaporation pan in January.

CLIMATIC DATA, 1961–62

TABLE I

AIR TEMPERATURES °F.

	New Site, 1961–1962						*Old Site, 1952–1961*	
	Abs. Max.	*Abs. Min.*	*Range*	*(a) Mean Max.*	*(b) Mean Min.*	*a + b* / 2	*Mean Max.*	*Mean Min.*
October	85·2	43·4	41·8	75·6	49·7	62·7	75·0	51·0
November	80·0	48·0	32·0	68·9	52·9	60·9	73·0	52·9
December	79·1	48·4	30·7	70·3	53·9	62·1	71·3	54·2
January	75·1	52·2	22·9	68·8	56·0	62·4	70·8	54·9
February	74·9	49·0	25·9	70·6	54·9	62·7	70·8	54·8
March	76·1	47·0	29·1	68·5	52·9	60·7	70·2	53·0
April	74·4	41·7	32·7	68·5	51·1	59·8	69·2	49·4
May	70·3	38·7	31·6	61·8	43·9	52·9	67·0	44·7
June	73·2	37·2	36·0	66·0	43·5	54·8	60·4	40·3
July	69·7	38·3	31·4	60·7	42·4	51·6	60·0	39·4
August	74·4	35·9	38·5	65·6	45·8	55·7	65·1	40·8
September	77·7	35·6	42·1	71·3	46·2	58·8	69·1	45·6
YEAR	85·2	35·6	49·6					

TABLE II

RAINFALL IN INCHES

	1961–1962				*Mean 1952–1961 Packing Shed Site*	
	Packing Shed Site	*New Site*	*Potato Land*	*Rainy Days New Site*	*Fall*	*Days*
October	0·85	0·86	0·69	6	1·68	4
November	3·90	4·98	7·11	20	5·23	14
December	5·12	7·07	7·51	13	9·24	19
January	9·09	10·10	11·95	22	12·73	21
February	7·15	6·95	8·46	18	10·14	20
March	10·61	13·51	12·88*	17	4·21	14
April	2·38	2·79	2·83	13	2·57	8
May	0·32	0·73	0·70	8	0·90	4
June	nil	nil	nil	0	0·67	6
July	0·90	1·38	0·96	8	0·57	4
August	0·18	0·19	0·16	4	0·88	5
September	0·10	0·58	0·25	1	0·64	4
YEAR	40·60	49·14	53·50	130	49·46	123

* Gauge overflowed.

TABLE III

BRIGHT SUNSHINE HOURS AND WIND

			1961–62 Monthly Runs in Miles	
	Totals 1961–62	*Means 1956–61*	*New Site*	*Old Orchard No. 11†*
October	298·3	278·2	5,846	1,831
November	155·1	198·4	5,038	1,355
December	229·9	164·4	5,652	1,704
January	134·9	175·0	4,146	1,303
February	176·0	150·3	3,654	1,050
March	224·9	222·8	5,000	1,636
April	232·9	243·1	4,581	1,551
May	253·3	252·9	4,996	1,667
June	285·4	236·3	3,269	1,614
July	226·6	246·0	5,192	1,952
August	280·0	276·7	5,286	1,939
September	307·9	260·3	5,903	2,073
YEAR	2,805·2	2,704·4	58,563	19,675

† Totally enclosed by windbreak.

FRUIT CROPS

Further fruit trees were grubbed from some of the old orchards, and as a result the 1961-62 crop was inevitably smaller than in previous years. It was, however, smaller than expected, possibly because of the warm winter and lack of rain in October, and the gross return was only £910. A high proportion of the crop was sold to individual customers at the station, many of whom were traders from the African townships around Umtali and Salisbury. This sort of trade has a tremendous potential as an outlet for cull fruit sold for processing in one form or another.

The low rainfall before Christmas probably accounted for the increased incidence of stem end crack in Ohinemuri and Rhode Island Greening apples, from which varieties little first-grade fruit was sold. Delicious had rather a small crop of reasonably good-sized fruit.

Though there was ample cull fruit for the purpose, lack of time precluded any pressing for cider this year. Vintage, i.e. acknowledged cider varieties, did not crop well.

Pear crops were reasonably good, though fruit size was poor. Max-Red Bartlett again produced a small crop which was of a rather mealy texture and ripened very quickly off the tree. A pressure tester was used this season to assess maturity, and gave good results.

Apricots, peaches, nectarines and plums all produced reasonably good crops. Governor Wood cherries were almost all withered in hot, dry winds at the end of October.

OTHER CROPS

It was decided to repeat the brussels sprout variety trial, and the cauliflower spacing trial, using the superior U.S.A. strain of Snowdrift, this year, but due to water shortages neither of these nor the trial of unnamed green sprouting broccoli varieties was wholly successful. Samples of sprouts sent for processing trials showed the superiority of Cambridge Special over Long Island Improved and Irish Glacier.

A small plot of radish is again being grown for the Seed Services in a more exposed position than last year. The 1961 sown crop was harvested in late January after a very long flowering season.

Phormium tenax planted in 1961 is growing well and seems relatively free from pests and diseases. Termites have killed about 5 per cent. of the fans, but the remainder appear to be completely unaffected.

A few specimens of the essential oil plant "nindi" were put out in mid-May in well-manured land at the nursery. Heavy frosts in June did not increase their chances of survival, but the Senior Horticulturist may be able to replace them should they die.

Fencing at the Mare Dam site was extended from the original half-acre to include approximately 6½ acres of usable land, and was completed in time to protect the crop planted under supervision of the Potato Breeder between 31st October and 2nd November. Rather more Up-to-Date were grown than in the previous season since a seed-rate trial was included this year. The variety collection was maintained and recently bred seedlings were grown for the first time. The latter, together with some of the new, unnamed varieties were culled by the Potato Breeder, who reaped the bulk of the crop at the end of March.

INTRODUCTIONS

Of the apple varieties imported in 1961 from South Australia, about 20 per cent. were lost through death (poor scion material) and removal because of infection with apple mosaic virus. Most of the remainder are growing very well and about 40 were flowering this year. Sixty-five of these varieties plus about 25 others from various sources were grafted on Merton 793 for inclusion in the screening trial in 1963.

The berry fruits introduced from Oregon in 1961 were released from quarantine at the end of February. They are now being grown in pots in a concrete basin so that the rather dangerous nematodes with which they are infested cannot escape into the neighbouring land. It is hoped to tip-layer a few of each variety in sterile soil and destroy the mother plants in due course.

None of the five black-currant varieties has done well, though the reason is difficult to ascertain. Day-length almost certainly has some bearing. Since it is easier to acclimatize plants from the southern hemisphere, five further black-currant varieties have been introduced from Tasmania, together with four varieties of gooseberry. These cuttings are being grown in boxes of sterilized soil in a protected position so that drying out, at least, should be no problem as it was in the nursery, which is very exposed.

It has been suggested that since reaction to day-length is polygenically controlled in most woody plants, a black-currant suited to short-day conditions might be selected from seedlings. Arrangements have been made to start this work with a gift of seed from a Lincolnshire grower, and a small propagation house is to be built for this purpose very shortly.

The blueberry varieties are surviving, but not really growing well. To encourage stronger growth some have recently been cut back to a single stem.

With the exception of Cambridge Vigour, the strawberries at the Mare Dam site have grown nicely but have not produced any quantity of runners. Quality of Red Gauntlet and Talisman is excellent, although the poorer-flavoured Cambridge Rearguard seems to have a greater cropping capacity. Of the two South African-bred strawberries, Klaradyn is superior in quality and runner production. Vumba, grown for the last two years in the eelworm-free nursery had done so poorly that it has been moved nearby to land which has been heavily manured.

All the peach and nectarine varieties being grown for propagation material in the nurseries are doing well and some will fruit this year. Scion material has been distributed to growers in the Inyanga district.

Raspberry material has also been distributed to growers. Judging by behaviour in the station's cane nursery and in local cropping plantations the only two varieties worth considering seriously are Lloyd George and Malling Promise, in that order. Even these are apparently losing vigour and an investigation into the cause of this is urgently required.

A further four varieties of apple were introduced from South Africa during the year, and material of two interesting seedlings has been supplied by growers for inclusion in the screening trial.

One new plum variety, Red Ace, has been top-worked on old Beauty trees, from material supplied by the Senior Horticulturist.

PESTS AND DISEASES

Experiments carried out by the Entomologist, Umtali, on the control of woolly aphis, are described elsewhere. Suffice it to say that the wasp parasite *Aphelinus mali*, introduced to the station in August, 1961, has established itself very well, and that in the orchards which were deliberately left unsprayed this last winter, the woolly aphis population has been reduced very sharply. Parasites have been seen in all the adjacent old orchards to which the aphis spread last season, and this means of control appears very promising.

No other pest was very serious during the year, and fruit-piercing moth damage was not appreciable. Several coleopterous species were collected for identification in the belief that it is as well to know what is here *before* any species reaches pest proportions.

Apple mildew was fairly severe on Winter Banana during the rather dry spring and early summer, but Golden Delicious did not appear to be infected to the same degree. Sooty blotch was, as usual, fairly common towards the end of the season, though not so bad as in 1961. Bitter rot was of negligible importance.

The Senior Plant Pathologist at Umtali continued his trials to control rust in Kakamas peaches, using the fungicide, zineb.

Apple mosaic virus is being carefully culled from nursery material and trees are being marked with a distinctive red band. Red paint will be used exclusively for this purpose at the station. Symptoms closely resembling those of the virus disease described in Australia as "Gravenstein Flat Limb" have very recently been seen in the variety Missouri Pippin. This also will be watched carefully.

The Senior Nematologist conducted a very thorough survey of the plant parasitic and non-parasitic nematodes in that portion of the new land so far allocated to tree fruit trials. He is also planning a series of experiments on the control of nematodes on mature apple, pear, and peach trees in the old orchards.

TRIALS IN THE NEW EXPERIMENTAL AREA

After considerable discussion a scheme was eventually devised to suit the requirements of all concerned whereby the land for these trials could be protected from erosion risk, planted with fruit trees equidistantly and be suited to an overhead sprinkler irrigation layout. In essence it is an extension of the old ridge and furrow land drainage idea known in Europe for centuries. Shallow furrows run on a fairly steep grade to a cental waterway so that run-off water is taken from the land as quickly as possible. Between each pair of furrows is a low ridge in the centre of which a rather sinuous row of trees is planted. These parallel ridges and furrows are continued up the principal slope until the furrows become too steep or too flat to be useful, when an adjustment wedge is inserted, after which a second series is made at a slightly different angle to the waterway. In the other direction all trees are in perfectly straight lines parallel to the edge of the waterway.

Since this layout was devised it has come to notice that similar practices are being advocated in both Queensland and South Carolina.

The land was prepared, in the fashion described, by means of a reversible plough, blade terracer, modified ditcher, and finally by hand. Before the ridges were smoothed off, dolomitic lime was applied at three tons per acre. Double superphosphate at the rate of one pound per tree was given in the planting hole. No organic manure or nitrogenous fertilizer of any kind was applied since analyses had shown the nitrogen content as adequate, and insufficient kraal manure was available.

The three trials planted were as follows:

Apple "Management" Trial

The experimental trees comprise Rhode Island Greening, Starking and White Winter Pearmain with Canvada and Ohinemuri as guard rows to facilitate pollination.

No differential treatments are to be imposed until the trees are established, i.e. about four years. Thereafter there will be three irrigation treatments (including dry-land), two nitrogen treatments and three types of soil management—"traditional", permanent sod, and summer legume.

Suitable grass and legume species are to be tried out for this purpose, before establishment of the trees is complete, in the old orchards. *Trifolium rueppellianum* was grown on a small scale in 1961/62.

Peach Management Trial

The varieties Kakamas and Culemborg appear in both experimental and guard rows.

As with the previous trial, treatments are not to be imposed until establishment is complete after two to three years. Irrigation is to be standard. Four nitrogen treatments will be used, and two soil management practices—traditional and permanent sod.

Apple Variety Screening Trial

This is not a statistically planned experiment but is essentially a preliminary trial of the apple varieties the station now grows, and also of promising kinds which it is hoped to introduce—all grown on a standard root-stock (Merton 793) and given the optimum treatment as it is now known. Each variety is represented by three trees. The trial will be extended annually as varieties become available, and can be made to occupy oddly-shaped pieces of land unsuitable for a major experiment.

FENCING

A security-type fence was erected around the whole experimental area and also encloses the major portions of old orchards numbers 1, 2, 3, 4 and 6. Containing two 20 ft. double gates and a pedestrian gate, it has a total length of 7,043 ft.

WINDBREAKS

After considerable discussion it was decided to plant a new *Pinus patula* windbreak in the new area to protect the trials which were planted later in the year, and further land which will be planted up in the next few years. This windbreak is in the form of three rows six feet apart with trees also six feet apart and staggered. One row will be removed after two or three years and a second after perhaps eight or ten years if this is thought desirable at that time. It is sited approximately north-east to south-west, cutting the new area into two sections of about 34 acres and 12 acres respectively. A second windbreak more or less parallel to the first and about 250 yards to the south-east will be planted in the 1962/63 rainy season to protect future trials in the smaller block. The break planted in January, 1962, suffered some losses during the recent dry winter, but gaps will be filled in during the rains.

A *Cupressus lusitanica* windbreak planted about 45 years ago, runs alongside the new area and has impoverished the soil in its immediate neighbourhood considerably. It also exerts an undesirable influence on the microclimate of the trial area. This break is, therefore, gradually being removed. Progress with this work during the year was spasmodic, as and when labour became available. Unfortunately, there is little demand for the timber, and the disposal of the cypress has become a major problem. It is hoped that all the trees will have been felled and logged by the end of 1962.

LABELS

A label which will weather well under our climatic conditions, and will be distinctive even to the casual visitor, is a very necessary adjunct to the trials, particularly screening trials. After much searching, two suitable types of matt surface plastic sheet, Cobex and Xylonite were found, and are now being tried out in the orchards, with stencilled names, using diluted printer's ink and a German ink specially designed for use with plastic material. The printed labels are attached to pointed hardwood pegs (of various widths and lengths according to the size and purpose of the label) which are driven into the ground. The station is indebted to Messrs. BX Plastics, of London, and their agents in Salisbury, Messrs. C. F. Buxton and Co for generous gifts of plastic sheet, and to the Director, National Fruit Trials, Faversham, England, for his advice in this connexion.

IRRIGATION

By the end of the year considerable progress had been made with the irrigation scheme, which involves the laying of some two and a half miles of 9 in. asbestos-cement piping in the ancient furrow from the Mare Dam to the Park Warden's house.

Although the pipe is laid in the furrow, the bed of the furrow is by no means uniformly smoothly graded, so that a great deal of earth movement is involved at times. Small irregularities in the alignment of the furrow are quickly cut away, but where it takes a very sharp turn, which would be better avoided to escape using prefabricated bends in the pipe, the cutting of a trench to accomplish this may take weeks of blasting and hand labour. No machines can be brought to the first half of the furrow, which runs through very steep country. After the pipe has been laid the furrow is back-filled and the pipe covered with earth. To prevent erosion and risk of damage to the pipe, Kikuyu grass is being planted after back-filling is complete and the earth has been consolidated.

In the nineteen thirties, the furrow washed away its wall at a point roughly half way along its length. This resulted in a deep gulley which eventually was bridged by a 5 in. steel siphon, and a second, lower, furrow was dug to carry the water from where the siphon met the gulley wall for the rest of its passage, virtually to the Warden's house. A scheme has been devised whereby replacement of the siphon by a similar but larger-diameter siphon is avoided, which method would always have the attendant risk of damage occurring to the pipe, making further replacement necessary. The scheme is to dig a trench from a point just above where the furrow enters the siphon, across and above the head of the gulley. The floor of this trench is on a very shallow grade, and enables water to be led from the 9 in. steel pipe laid in the trench, into the original (higher) furrow. Since this original furrow has a shorter course round the hillside, it is hoped to effect a considerable saving in asbestos-cement pipe by this scheme. The trench has been dug, the pipe laid in it and covered. It remains to be joined up with the asbestos-cement pipe when the latter reaches this point, some time in the current rainy season. The station is indebted to Mr. Pauls, of Matopos, for his suggestions and for considerable practical help with the scheme.

To enable trees in the new trials to be watered adequately it was necessary to provide a means of taking water to them without any waste, since supplies were extremely short. This was eventually done on the advice of Mr. Turck of the Department of Conservation and Extension, by leading water through 2-in. rigid polythene pipe, 3 in. and 2 in. lightweight quick-coupling aluminium pipe, and finally through a long length of $\frac{3}{4}$ in. plastic garden-type hose. Men led the ends of the latter up and down rows, watering individual trees in their basins. The aluminium pipe will be utilized later in the final reticulation scheme for the whole area.

BUILDINGS AND MACHINERY

A few minor repairs and improvements were made to farm buildings during the year, including the provision of a hot-water heating system at the office/laboratory.

To avoid having to borrow again from other stations, additional equipment was hired from C.M.E.D. to carry out preparation of the new land and to improve the standard and speed of work in the old orchards. These items included a reversible disc plough, Hayter type mower, heavy offset discs, a larger post-hole digger; the old petrol tractor was replaced by a new diesel model.

From the station vote a small motorized lawn mower and a low volume, motorized knapsack sprayer/duster were purchased. The workshop was fitted with oxy-acetylene welding equipment, and more small tools were acquired.

MISCELLANEOUS

Mrs. H. A. W. Payne commenced duty on 19th March as temporary clerical assistant, working ten hours per week. By agreement this work can be extended to field work if and when this is warranted and feasible.

The normal casual labour force was quite incapable of doing all the work necessary for land preparation, fencing and irrigation, and since it proved impossible to recruit male labour locally the force was augmented by men from Matopos Station and from the Umtali Employment Exchange. A gang of local women was also employed for a considerable period.

Because of increased work at the station itself, the advisory work has had to be curtailed. Growers have been informed of this, and the local Conservation and Extension Officer is assisting wherever possible. Time was found, however, for a second annual visit to growers in the Melsetter area on 14th and 15th March in company with the Horticultural Officer, Melsetter.

A small field-day was held at the station in very wet weather on 26th January. Its object was to demonstrate methods of pest and disease control, but because of the weather this had to be changed to a discussion of pest and disease problems, and of the choice of fruit varieties.

At the suggestion of a grower-member of the Liaison Committee, Mr. Thomson, a newsletter was prepared and distributed to growers. It was well received and is to be published twice a year.

The station was especially honoured by a visit from His Excellency the Governor-General of Mozambique, Admiral Rodrigues, and Senhora Rodrigues and a party of about 50, in May. Other notable visitors of the year included Mr. John Foot of the Ministry of Home Affairs, and Mrs. Foot, Sir Oliver Crossthwaite-Eyre (M.P. for New Forest (U.K.) and Chairman of Claremont Estate), Mr. P. H. Haviland, member of the N.R.B. The station is indebted to Miss E. C. E. Ellenberger, of East Malling Research Station, for advice on virus problems, and to the officers-in-charge of Levin Research Station, New Zealand, and of the Scoresby and Tatura Research Stations, Victoria, for help of a general nature. For gifts of planting material the station is also indebted to Mr. J. F. D. Hargreaves of Goxhill, Lincolnshire, to the Department of Agriculture, Tasmania, and to Mr. R. C. C. Green and Mr. A. C. Pye, both Eastern Districts growers.

SABI VALLEY EXPERIMENT STATION

INTRODUCTION

The Sabi Valley Experiment Station, situated on the east bank of the Sabi River some 20 miles south of the Umtali-Chipinga road, was established during 1950/51 to provide facilities for the investigation of all aspects of irrigation agriculture appertaining to lowveld conditions, and as the first stage in the multi-million pound development project proposed for the Sabi-Lundi Valleys; a project designed to produce large quantities of quality food and agricultural raw materials.

The work of the Sabi Station includes a wide range of investigations connected with both crops and soils. These investigations are directed towards obtaining the necessary information on what crops to grow and how to grow them, on crop rotations to suit the conditions and the types of farming envisaged, on water requirements of crops and irrigation methods and on the effects of water and crops on soil physical and chemical conditions. Adequate field and laboratory facilities are available for this work; also, an Animal Husbandry Section is maintained, the primary purpose of which is to determine how best to utilize the forage and ley crops and crop residues produced in the course of intensive irrigation farming operations.

During the period under review, both summer and winter crop yields were disappointingly low due to certain unforeseen and mainly uncontrollable circumstances which were experienced, and the value of experimental results therefrom was reduced accordingly. The incidence of pests and diseases was particularly severe, and a high total rainfall along with unusual distribution interfered with irrigation efficiency and consumptive use investigations. Waterlogged conditions, aggravated by the lack of surface drainage facilities, persisted for considerable periods on the experimental plots and contributed largely to the high variability experienced in all field trials.

Nevertheless, much useful information was obtained and valuable experience was gained of the problems associated with adverse conditions. The main results and observations are reported below.

WEATHER

Compared with the previous few years, weather conditions, particularly rainfall, during the season under review were most unfavourable for crop growth and for irrigation studies. As shown below, rainfall was abnormal both in amount and distribution, and precipitation in considerable excess of the 1954/60 means was recorded for the months of October, January, March and April.

Rainfall (inches)	*1961/62*	*1954/60 Means*
October	2.48	0.64
November	1.95	3.03
December	0.96	5.17
January	12.15	3.33
February	2.10	3.56
March	4.05	1.74
April	2.69	0.68
TOTALS	26.38	18.15

Total rainfall amounted to the second-highest on record at the station. In January, rain fell almost continuously from the 9th to the 27th, during which period the greatest precipitation experienced to date over 24 hours, namely 3.92 inches, was recorded. Temperatures, however, were lower than average throughout the season which resulted in more tolerable living conditions.

Winter weather conditions were fairly normal apart from appreciable temperature fluctuations in May, which month on the whole was considerably cooler than usual. With the exception of a light shower in mid-September, no rain was recorded during the winter months.

FIELD CROPS RESEARCH

The excessive and prolonged rains in January were responsible for considerable damage, both directly and indirectly, to cotton, maize and sorghum and contributed to the failure of the cotton crop.

The incidence of insect pests was high throughout the summer season, and an early appearance of American bollworm and lesser army-worm, associated possibly with favourable humidity conditions in late October and early November, resulted in extensive damage to lucerne and to young maize and cotton before control measures could be taken.

Rust incidence on the winter cereals was particularly severe. The standard wheat variety (Angola strain X2-50) which had escaped serious damage in the past three seasons was, in certain sections, so badly attacked by stem rust that both yields and grain quality were very substantially reduced.

Little trouble was experienced in obtaining good stands of lucerne, cotton and wheat but, as in the previous year, great difficulty was encountered in establishing a satisfactory bean crop due to soil crusting. Early over-irrigation resulted in a set-back to the crop from which it never fully recovered.

Most of the experimental crops work was carried out on the Mopani Farm and superimposed on the large-scale rotation commenced last year. The experimental area Acacia Farm was not cropped during the winter season due to relevelling operations and the construction of surface drainage facilities.

Cotton

Little useful information was obtained from the results of the agronomy trials on cotton due to the failure of the crop, but very valuable experience was gained of problems associated with early and continued American bollworm attack, and of the reactions of the cotton plant to the loss (shedding) of squares, flowers and bolls due to insect damage and to unfavourable weather conditions.

Previous experience had shown that in most seasons the red bollworm made its appearance first and necessitated the commencement of control measures (endrin/sevin) at the early bud stage; American bollworm generally appeared much later and often suddenly during the period of peak flowering when a change of spray chemical (to D.D.T.) became necessary for control.

During the past season the order of appearance was reversed. American bollworm attack commenced early and continued throughout the life of the crop and it would seem that control measures were never completely effective in spite of repeated spraying with D.D.T. The reasons for this have not been fully established, but investigations carried out by the Cotton Pest Research Team, Gatooma, indicate that the D.D.T. may have been of inferior quality and/or that ineffective control was due in part to a certain incompatibility of the sevin/D.D.T. and malathion/D.D.T. mixtures used.

The situation of inadequate pest control was further aggravated by the prolonged rain in January, during which period spraying was either impossible or ineffective for three consecutive weeks. This resulted in a marked build-up of pests which caused extensive damage. Also, acute physiological boll-shedding was observed which was associated with the humid, cloudy conditions experienced.

By mid-season it was apparent that very low cotton yields could be expected due to the almost complete loss of the bottom crop and to the fact that the plants were making phenomenal vegetative growth at the expense of flowering and boll set. At this stage the crop was inspected by Gatooma Research Station personnel who expressed the opinion that loss of the bottom crop was due predominantly to American bollworm damage, and pointed out that cotton plants may react characteristically to marked crop loss by continuing to grow vigorously and by producing further flushes of buds and flowers; the robust growth observed could therefore be due in part to loss of crop caused by American bollworm damage. During the later stages of the crop also, rank vegetative growth impaired the efficient distribution of the insecticides and caused some trouble with the tailboom attachments.

The following further observations on the cotton crop are of some interest:

1. The extent of boll shedding on all trials appeared to be related to the growth and vigour of the crop; this is reflected in the results of the nitrogen/populations trial in which higher yields were obtained at low nitrogen levels due to reduced shedding in these treatments. (For example, 785 lb. seed-cotton (s.c.) per acre from plots receiving 40 lb. N. and 339 lb. from plots receiving 200 lb. N.)
2. Normal growth was observed on the Class A soil section of the Mopani rotation trial where cotton was grown without nitrogen fertilizer following varying periods of lucerne and of cash crops. Following lucerne the plants were well grown but by no means rank and the average yield recorded amounted to 2,727 lb. seed-cotton per acre with a high yield of 2,927 lb. Assuming that the bottom crop, or a proportion thereof, was lost and that further loss of crop occurred during the rainy period in January, it may be reasonable to conclude that, given effective pest control, reasonably good and normal yields for the variety would have resulted. On the C Class soil section of this trial, however, also grown without nitrogen addition and similarly treated as regards spraying and irrigation, the growth of the cotton was extremely rank and yields (averaging 1,615 lb. seed-cotton per acre) were affected by differential shedding as in the nitrogen trial.

Although the loss of information from the agronomy trials resulted in an unfortunate and serious set-back to the research programme, considerable information on, and experience of many problems connected with cotton growing in the Sabi Valley has been gained which will prove invaluable in advisory work and in the planning of future research.

Maize

The season was not a good one for maize. An unexpected attack by American bollworm and, to a lesser extent, by army-worm, did considerable damage to early plantings before control measures could be taken, and further damage was sustained and crop growth adversely affected by waterlogging during the January rains. October and November plantings suffered little from virus streak and rust but these diseases were rife in areas planted after the first week in December.

The main problem with maize, apart from that of lodging, is the lack of suitable varieties. The climate is such that the potential of the Salisbury hybrids used is repressed and yields are lower than desired; quicker maturing types are required. In lieu of a breeding programme, the approach to solving this problem is by introducing and screening material for adaptability from other sources, and to this end a number of South African hybrids and top-crosses were obtained and assessed in a variety trial. A second variety trial was conducted using material obtained from the Salisbury Experiment Station.

Yields were higher than anticipated from appearances and differences between varieties were relatively small in both trials. Of the South African material tested, Sabi No. 3 yielded 28.8 bags per acre and appeared promising, and identical yields, namely 27.5 bags, were obtained from the quick-maturing variety S.A.5 and the long-season Salisbury Hybrid No. 11. Although eight of the Salisbury hybrids yielded over 25 bags per acre (the new hybrid 58H6 giving top yield of 29.3 bags) this is well below the potential of the material.

Results from a nitrogen/populations trial, which averaged 16.2 bags per acre, confirmed those previously obtained, showing little or no significant increase in yield over 80 lb. per acre N and no interaction with populations.

A comprehensive study of lodging and its control revealed significantly that lodging in maize could be reduced by adequate nitrogen, by ridging up (at six weeks after top dressing with fertilizer) and by termite control using dieldrin, whereas sub-soiling as such was ineffective. It was deduced from the results that ridging and termite control were of more importance in reducing lodging than nitrogen, but that the latter had a considerable effect in the absence of the others. Regarding the control of termites in maize the indications are that directional spraying of dieldrin to the base of the stems at the tasselling stage may prove the most effective treatment.

Very effective weed control in maize resulted from the use of simazine as a pre-emergent spray; one cultivation was necessary later to remove persistent grass species.

Wheat

Excellent stands of wheat resulted from both hand and machine methods of planting; growth rate continued satisfactorily throughout the season but ear size generally was disappointing and much grain proved of inferior quality due to rust damage. The standard variety (F21B3/X2-50) used in agronomy trials was attacked earlier by stem rust and more severely than in past years, although not uniformly so, and the value of the results was reduced accordingly. Plots late planted to this variety were most severely affected and produced little or no grain. Quelea damage was again very severe; populations appear to be building up steadily and constitute a major hazard to experimental work and to wheat production in the Valley.

Some 50 wheat varieties, including last year's selections and new introductions received from the Wheat Breeder, Salisbury, were studied in replicated and observation trials and in bulking plots; the very marked differential susceptibility to both stem and leaf rust, along with plant characteristics of variable straw length and strength, allowed only nine varieties to be selected as suitable for further trial at Sabi. The urgent need for a Plant Breeder to speed up this work is again stressed. Yields varied from practically nil to just on 14 bags of grain per acre. Three of last year's selections proved resistant to stem rust and yielded over 12 bags of grain; two of these were bulked up for use in agronomy work next season along with a very short and strong strawed variety also stem-rust resistant at this stage. Of the new introductions, seven yielded at the rate of over 13 bags of grain and scored light, medium or complete resistance to stem rust.

A repeat study of the effects of varying spacings and seed rates on wheat yields again favoured 14-inch rows and confirmed experimental findings of the past three seasons. A nitrogen and phosphate fertilizer trial gave inconclusive results due to rust damage which was most prevalent in the rank growth produced by the higher levels of nitrogen; lodging also was marked following applications of 160 and 200 lb. N applied as sulphate of ammonia.

Beans

As last year, problems associated with emergence impedance by soil crusting were experienced. Excess water required to soften the crust resulted in temporary waterlogging which prevented the establishment of satisfactory stands and promoted patchy early growth. Lower overall yields were recorded and reduced experimental information was obtained.

Subsequent investigations on methods of establishment, however, showed that deep planting in wet soil (to 3 in.) resulted in satisfactory stands and uniform, vigorous growth.

In a study of 16 varieties for seed yield and rust tolerance, the highest yield of 1,984 lb. per acre was obtained from Canadian Wonder, which was closely followed by *White Processor*. The success of this latter variety is encouraging in view of the fact that overseas markets demand this type of white haricot bean. No variety was entirely immune to rust; those most severely attacked were low yielding white varieties.

Further work on planting methods confirmed the need for close in-row and between-row spacing for high yields and a fertilizer trial demonstrated the necessity for nitrogen fertilization (up to 80 lb. N) before satisfactory seed bean yields can be expected under station conditions.

Lucerne

Analysis of dry-matter yields from a comprehensive fertilizer trial on lucerne testing four levels of sulphur and two each of phosphorus, boron and calcium showed a small but significant response to sulphur over a 10-month period (8 cuts); the response was quadratic in nature with the optimum level at 50 lb. per acre sulphur. The main effects of phosphorus, boron and calcium were not significant. Yields were depressed by boron and increased by calcium at the lower levels of sulphur application, and were increased by boron and depressed by calcium at the higher sulphur levels. The mean yield per cut amounted to 0.96 ton per acre oven-dry matter over the period, which is low in terms of farm hay yields. Intervals between cuts taken at 10 per cent. to 25 per cent. flower, varied from 54 days in

May/June to 30 days in September/October, with an average of 42 days over a 12-month period.

Some seven acres of lucerne were successfully planted in 7 in. and 14 in. rows at 11, 13 and 22 lb. seed per acre.

Other Crops

Sorghum.—Irrigated and dry-land trials were carried out as part of the Matopos Research Station's sorghum ecology programme to assess the reaction of a range of sorghum varieties to varying environmental conditions. Yields varied from practically nil up to 18.0 bags from Red Swazi (irrigated) and 13.2 bags from USK 32 (dry-land). The poor yields were associated mainly with damage by sorghum midge, the varieties being affected differently depending on the coincidence of flowering and insect attack.

Sunflowers.—Preliminary trials were carried out to investigate the adaptability to local conditions of six sunflower varieties, and to determine the response of three of them to varying spacings with particular reference to lodging. Despite considerable lodging and some rust attack which came in late, a very good top yield of 30.8 bags (125 lb.) was obtained from variety *Short Russian* and two of the other varieties yielded just over 20 bags seed per acre each. In-row and between-row spacing results (interactions) were not significant but indicated that a spacing of 2 ft. x 12 in. may be optimum and practical. Very high lodging percentages were recorded from the close spacings tested.

Barley.—In a barley/wheat yield comparison trial, the highest barley yields so far recorded at the station (over 25 bags) were obtained from two varieties, including Atlas California, grown from adapted seed. Two new introductions yielded at the rate of 19 and 20 bags respectively. Barley has always outyielded wheat at Sabi.

Commercial seed bulking of Atlas California gave a return of 45 bags seed from four acres.

Rice.—Variety Century Patna was planted (3.12.61) in 14 in. rows at 60 lb. per acre seed and grown under paddy conditions on Mopani Class C soil; a total of 105 lb. per acre N was applied to the crop which required over 50 inches of water and yielded at the rate of 21.3 bags (200 lb.) per acre unhulled grain.

ROTATION TRIALS

The short-term crops sequence trial, designed to investigate the effects of cropping systems on soil conditions, was terminated after two seasons. Good wheat, cotton and maize yields had been obtained from this trial but there were no significant differences. Results from a test cropping to maize, which received 30 lb. per acre N at planting were as follows:

Treatment	*Crop*	*Yields 1961/62 Maize Test Crop (bags per acre)*
1	Dhal (cut and mulched)	25·6
2	Tanner grass cut for feed	13·8
3	Tanner grass grazed	14·2
4	Lucerne (cut)	30·3
5	Continuous grain (Maize/Wheat), stubble ploughed in	14·9
6	Continuous grain (Maize/Wheat), stubble removed	11·8
7	Continuous grain (Maize/Wheat), stubble replaced with compost	20·8
8	Cotton/Beans and Cotton/Wheat	18·6

The trends in maize yields were as expected and the beneficial effects of previous cropping to lucerne and dhal and the value of compost were well marked. As observed by Gatooma Research Station also, there is an indication of the beneficial rotational affect of cotton on maize yield.

It is not possible to determine whether the higher maize yields were due to nitrogen effects or to improved soil conditions or both. Analyses of soil samples taken prior to test cropping showed soil nitrogen to be higher under dhal and lucerne than under the other treatments and that all plots with residues returned had higher carbon contents than those where residues were removed, including lucerne. It was noted, however, that plots planted to maize following lucerne and dhal were much more uniform and better grown than elsewhere.

The Mopani 5-Course Rotation Trial was terminated at the end of the 1960/61 season, but two replications, one on Class A and one on Class C soil were retained to study the decline in production following continuous cropping. During the summer season under review the plots were test-cropped to cotton without nitrogen addition and during the winter to wheat, with and without nitrogen (split plots).

The beneficial effects of lucerne on cotton yields have already been mentioned; summary results in lb. per acre seed-cotton are as follows:

	Class A Soil	*Class C Soil*
Following lucerne	2,727	1,636
Following cropping to maize and wheat . .	1,615	1,383

Plant growth on the Class C soil was very rank which was associated with pest damage and adverse weather conditions.

In the wheat crop, very considerable differences in growth and yield were observed between split plots fertilized and unfertilized but, as shown below, the rotational effects were masked by nitrogen application.

	With N	*Without N*
	(bags per acre)	
Lucerne in 1961 followed by cotton (unfertilized)	11·16	5·07
Following annual crop cycles (wheat and maize) and cotton (unfertilized)	11·14	3·05

Fertilized plot yields were good for the season and variety used; rust came in late and damage did not appear to be serious.

It is appreciated that an investigation of rotational effects should receive a high priority in the agronomy work at Sabi.

IRRIGATION EFFICIENCY STUDIES

The season's work was confined to the larger farm-scale plots, and stress was placed on water measurement rather than on crop response.

On *800 x 30 ft. Acacia plots* graded to 1:500, leading streams of 3 and 6 cusecs were compared using flat and ridged maize as the test crop. A total of 11 irrigations were required which applied excessive amounts of water (40.8 and 35.7 inches) at both flow rates on the flat. Considerably less water (20.1 and 25.0 inches with 3 and 6 cusecs respectively), was applied to the ridged plots with only a slightly depressing effect in yield. The 3 cusec ridged treatment applied approximately the amount required for the crop, the application/evaporation ratio (0.79) being of the order deduced from consumptive use trials on maize. Water distribution was good with the exception that about 20 per cent. more water was applied at the upper end of the plots in the case of the 3 cusecs flat treatment.

Similar methods on *500 x 15 ft. Mopani Class C* plots planted to maize and using a stream of 1.5 cusecs, applied reasonable amounts of water to the crop, namely 23.8 and 16.8 inches on flat and ridged plots respectively, but distribution of water down the length of the plots as indicated by sub-plot yield sampling was poor, with a steady decline with distance from the canal. Yields were generally low and exhibited considerable variation within the plots; this finding is not unusual with the deeper rooting crops on this heavy soil type.

Beans, irrigated on the flat in a test comparing leading streams of one and two cusecs on Class C soil, however, developed uniformly and well, and no significant differences were observed between yields under the two flow rates although slightly less water was applied using the two cusecs stream:

Flow Rate (cusecs)	*Yield (lb. per acre)*	*Irrigation (inches)*
1	1,712	24·6
2	1,802	20·6

Studies are continuing on leading stream requirements of lucerne planted on heavy soil. Growth has proved patchy and generally poor, and water distribution has not followed a consistent pattern due to the presence of compacted soil area.

On the *390 ft. long grade plots,* Acacia soil, planted to lucerne in June, 1961, leading streams of one and two cusecs were used for the first 12 months during which period 29 irrigations were required. On the 1:200 grade, the one and two cusec streams applied on average 1.7 and 1.9 inches of water per irrigation respectively, which proved to be too low; the lucerne showed signs of moisture stress during the summer. On the 1:350 and 1:500 grades, lucerne growth was more uniform and vigorous indicating that requirements for water were being met; applications amounted to 2.9 and 2.6 inches for the two flows on the 1:350 grade and 3.4 and 3.0 inches per irrigation on the flatter 1:500 grade. Distribution down the plots was good on the 1:200 and 1:350 grades with a tendency to apply more water at the canal end with the lower flow. This applied also to irrigations with one cusec streams on 1:500 grade but using two cusec flow, more water was applied at the lower end of the plots.

During the winter months the flow rates were changed to suit the grade concerned. This investigation is continuing.

CROP WATER REQUIREMENTS

Studies continued on the evaluation of evapotranspiration by gravimetric techniques, and the correlation of results with climatological and phenological data.

Consumptive Use.—Direct soil sampling associated with root depth and the determination of changes in soil water content were used to estimate the total water requirements of crops, the stages of plant development at which peak consumption occurred and the depth of soil water withdrawal at different stages of development. Also, relationships were determined between Et/Eo ratios and percentage cover, leaf and stem dry weights and total crop dry weights. As experienced last year, rainfall interfered with these investigations during the summer months and stressed the need for plot protection in evapotranspiration studies of this type if meaningful results are to be obtained. Some results from the consumptive use trials on cotton, maize, sorghum, beans and wheat were as under:

For cotton a mean Et/Eo ratio over the life of the crop of 0.89 was obtained, with peak consumption, associated with full cover, occurring during the period 16-22 weeks after planting when the Et/Eo ratio was ± 1.15. It was found that the withdrawal of soil moisture as indicated by the depth of 90 per cent. consumption, increased in a linear fashion to 45 in. at about 14 weeks which also coincided with full crop cover. Water applied, including rainfall (20 in.), amounted to 53.1 inches and the mean yield was 1,208 lb. seed-cotton per acre.

For maize the mean Et/Eo ratio was found to be 0.77, with peak consumption occurring after silking was complete at ± 12 weeks and the Et/Eo ratio 1.1. Water was withdrawn from a maximum depth of 39 in. at 12 weeks after planting which coincided with the period of peak consumption. The crop received 40.1 inches of water (including rain) and gave a yield of 24 bags.

Relatively few samples for soil moisture determination were taken from the sorghum trial; the results indicated that the mean Et/Eo ratio was about 0.67 and that peak consumption appeared to occur ± 9 weeks after planting when the crop was in full flower and the Et/Eo ratio was 0.95. The depth of water withdrawn reached a maximum of 42 inches 9 weeks after planting, coinciding with the peak consumption period.

It is worthy of note that sorghum planted early in October attained full cover in the very short time of six weeks.

The crop received 24.5 in. irrigation water plus rain but the yield was drastically reduced to 15 bags by very severe bird damage.

For beans the mean Et/Eo over the life of the crop was 0.81 with peak consumption, at a ratio of 1.03, occurring during the period from 7 to 10 weeks after planting, which coincided with the main flowering period and the stage at which full ground cover was attained.

Tensiometers, resistance blocks and soil sampling methods were used to determine depth of withdrawal which indicated that extraction increased in a linear fashion to about 2 feet at 7-8 weeks and thereafter remained relatively constant until the drying-off period. The crop received 20.6 in. irrigation water and yielded 2,263 lb. per acre clean, ungraded seed.

For wheat the mean Et/Eo ratio was 0.77 with peak consumption at 8-10 weeks after planting when the ratio was 1.05. The period of maximum consumption of water corresponded with the appearance of the ears and maximum ground cover. Soil sampling showed that water extraction took place to a depth of ± 2 feet whereas root washing studies indicated well developed root systems to over 3 feet deep.

The total water appled amounted to 25.9 inches; the crop, which was severely attacked by rust, yielded 4.7 bags.

Apart from last year's results for wheat, which are considered unreliable, the ratios obtained this past season were higher, and those for cotton considerably higher than those previously found. This may indicate luxury consumption of water under the non-limiting soil moisture conditions maintained in each trial. It is pointed out, however, that in this method of approach to crop water use investigations, irrigation control is based in part on soil constants and depths of rooting, all of which have proved difficult to determine with accuracy and confidence, and in fact there are indications that certain of the assumptions made, for example in regard to the depths of water extraction, may have been incorrect. Also, soil variation over short distances considerably increases the error in gravimetric moisture determination under the present system of soil sampling employed. It would appear that an easier approach to obtaining information on crop water use is required.

Irrigation Control from Estimates of Evapotranspiration

A somewhat different approach to crop water use investigations was made in a series of trials designed to assess the optimum coefficient applicable to open-pan evaporation readings (Eo) in order to provide an estimate of evapotranspiration that could be used as a practical basis for irrigation control.

Treatments consisted of a range of pan factors based on a 50 per cent. depletion of available water in the root zone and on evapotranspiration curves dependent on past experience of time to full cover and peak consumption of water. Soil moisture deficits were pre-defined for each treatment separately, taking into account information on root depth increments between planting and maturity.

Trials were conducted on cotton, maize, sorghum and lucerne, and on wheat and beans. Unfortunately, statistically significant yield results were recorded only from the *maize* trial in which the highest yield of 27.9 bags was obtained from the 0.8 Eo treatment; this is in close agreement with results of the consumptive use trial, which indicated an Et/Eo ratio over the life of the crop of 0.77. The *cotton* trial was affected by rain and pests, and possible yield differences were masked by the variable nature of boll shedding associated with patchy waterlogging. In the *sorghum* trial there were marked visual differences between treatments but severe bird damage resulted in complete loss of information on comparative grain yields. Rain interfered with irrigation control in *lucerne* and sampling was abandoned during the summer months. During the period from 1st April to 21st September, no significant yield differences were observed over the range of treatments 0.3 Eo to 1.0 Eo; the highest yield of 3.99 tons per acre dry matter (4 cuts) was obtained at 0.8 Eo which required 10 irrigations and a total of 29.2 inches of water. The factors 0.3 and 0.4 imposed considerable moisture stress on the lucerne crop and it is surprising that the yields of those treatments were not significantly reduced.

In the *bean* trial the yields varied from 944 lb. to 1,523 lb. per acre and were influenced by the temporary waterlogged conditions which existed during the early growth stages; differences were not significant. The highest yield was obtained from one of the dry treatments (0.3 Eo at 50 per cent. depletion of available soil moisture) which received 16.8 inches of water in 6 irrigations.

Wheat yields from all treatments (the mean being 5.69 bags) were reduced by rust which tended to be more severe in the wet treatments where growth was denser. Yield differences were small and not significant; no yield reduction was apparent at the dry moisture levels and it was seen that irrigation schedules could be based satisfactorily on previous evaporation data.

The results indicate that wheat, beans and lucerne can withstand considerable moisture stress and that their requirements for irrigation water are low. This may be due to variations in rooting habit between treatments as a result of varying soil moisture status, and it is possible if not probable that the dry treatments obtained moisture from lower soil levels. Or, it may be that the Et/Eo ratios obtained from the consumptive use trials are high, being influenced by luxury consumption.

LABORATORY AND SOIL RESEARCH

As is the previous year, emphasis was placed on the measurement of crop water use and consequently the laboratory spent the most time on routine soil moisture determinations and on the evaluation of the results. Compilation of data on the physical and chemical properties of Valley soils continued however and some interesting and valuable results were obtained.

(a) A study was made of the *water retention* capabilities of the main soil types, the *available water* being calculated as the difference between field capacity measured *in situ* under plastic sheets and the moisture retained at 15 atmospheres obtained in the laboratory on profile samples.

It was found that the Acacia soils examined have higher water-holding capacities than those of the Mopani soils. Practically, the difference is quite marked in that the summer irrigation frequency for a deep-rooted crop such as cotton may be four or five days closer on the Mopani than on the Acacia soils.

Preliminary work indicated also that the available water in Class C soils is very similar to that in the Class A, and that the Class S and Mopani Class A soils have similar water-holding capacities. This latter observation suggests that the deeper-rooted crops could be grown satisfactorily on the sands throughout the year.

(b) *Mechanical analysis* conducted on soil samples taken at 6 in. intervals from a limited number of profiles on Acacia Class A, Mopani Class A and on Class S soils gave the following information:

The *Acacia soil* is typically a sandy loam overlying a sandy clay loam or sandy clay to a depth of 2-3 feet, below which there is a decrease in the clay content accompanied by an increase in the silt and fine sand fractions.

The *Mopani soil* is very similar to the Acacia Class A soil, varying from a sandy loam (which, however, is somewhat heavier than the Acacia top soil) to a sandy clay loam at 2-3 feet. The same decrease in clay and increase in silt content below 3ft. is evident and it may be important to note that this soil below 6 in. has slightly less clay and fine sand throughout the profile as compared with the Acacia soil; this may explain the lower water-holding capacity of the Mopani soil.

The *Class S soil* varies from a sand in the 0-6 in. zone to a sandy loam between 2 and 3 feet; coarse sand comprises up to 40 per cent. of the total sand fraction, and the profile contents of silt and clay are lower than found in the Acacia and Mopani soil types. In view of this it is surprising that this soil should be characterized by a comparatively high available water content.

(c) *Soil Fertility Studies:* Physical and chemical analyses were conducted by the Chemistry Branch on Acacia and Mopani soil samples taken in 1954 and again in 1961 from about the same sites. The results indicated that:

(i) although the silt content of the top soils showed a decrease, the clay fraction had increased in most cases; this would indicate that there has been no movement of clay from the top soils during irrigation over the years with the very pure Sabi river water;

(ii) the pH had tended slightly to decrease;

(iii) the phosphate contents indicated no definite change;

(iv) in all except one case there was a substantial decrease in potash levels although the soils still showed adequate potash status (0.56 to 0.9 m.e. per cent.);

(v) exchangeable magnesium showed a similar trend to potash; soil levels are still high, however, most figures for 1961 soils being in excess of 1.5 m.e. per cent.

Changes in fertility under different cropping treatments were followed from results of analyses of soil samples also conducted by the Chemistry Branch; observations thereon have been made in the section on Rotation Trials. Physical tests on these soils showed that *bulk density* under tanner grass is very high, indicating that no beneficial soil effects are likely to obtain under this grass. Bulk density figures indicated a gradual decrease from tanner grass to lucerne, wheat and dhal; it can be concluded that a vigorous, deep-rooting crop such as dhal might improve soil conditions by reducing bulk density where compacted layers are present.

GENERAL

The cement lining of the main canal supplying water to the Development Farm and to the station continued to deteriorate; plans were put in hand and work started to replace the section entering the storage dams and to carry out other major repairs.

Liaison with the Southern Rhodesia Department of Native Agriculture continued, and visits were made to Triangle Limited and to Hippo Valley Estates to assist with experimental work on sugar-cane and citrus.

Station technical maintenance of a high order was carried out during the year. Engines, pumps and farm machinery, and all buildings were maintained in good repair; a new agronomy building was completed which proved an invaluable asset at the farm site.

The staff position remained unsatisfactory, due to continued shortage.

Mr. S. Murch was engaged as a learner Technical Assistant on 2nd October, and took up the post of Technical Assistant, Agronomy, which had remained vacant since January, 1961.

The post of Technical Assistant, Laboratory, which had been filled on a part-time basis by Mrs. Metelerkamp, was accepted by Mrs. J. V. Gilling who commenced duties on 18th December.

Mr. J. S. H. Steyn, Farm Manager, resigned on 1st September, and a replacement is not expected until late in the year.

Repeated efforts to fill the Agronomy (Professional Officer) post were unsuccessful.

A five-year survey of evaporation, 1957 to 1961 was undertaken by Mr. Cackett, Senior Agronomist, and was published under the title of "An Analysis of Evaporation at the Sabi Valley Experiment Station, 1957-61", by the Rhodesia and Nyasaland Meteorological Service.

GWEBI AGRICULTURAL COLLEGE

INTRODUCTION

The College year under review commenced on 5th October, and Diploma Day was held on 18th October, 1961, when His Excellency the Governor of Southern Rhodesia, the Hon. Sir Humphrey Gibbs, K.C.M.G., O.B.E., was the guest of honour. His Excellency presented the diplomas to Course 11, and the trophies and prizes to Courses 11 and 12.

Sport plays an important part in the general life of the College. In addition to the friendly and league matches played against outside teams, the first- and second-year students play each other at all sports. The Governor's Bowl for inter-year sport was presented to the College by Sir Humphrey Gibbs during 1961, so that His Excellency was able to present his trophy to the winning year for the first time, on Diploma Day. Inter-year sport has developed gradually over the years and the competition for this trophy has now become an important feature of College life, particularly as all students can take part, as players, linesmen, scorers and organizers. The sports include rugby, cricket, hockey, athletics, tennis, water-polo and squash.

The College continued to be adequate in size to satisfy the requirements of the Federation in the training to accepted standard of properly qualified young men in the science and practice of agriculture.

EDUCATION

Thirty-two students of Course 12 sat the final Diploma examinations in July, 1962. All 32 students obtained the Gwebi Diploma, 12 of these being first class. This is the fourth time in Gwebi's history that all second year students have obtained the diploma, former occasions being Course 4 in 1954 (17 diplomas), Course 5 in 1955 (18 diplomas) and Course 11 in 1961 (32 diplomas, 15 of which were first class). Courses 4 and 5 were in residence before the expansion which took place soon after their time. Course 13, which completed its first year in July, 1961, has produced the largest second year course Gwebi has known, 33 students having qualified. There is far less wastage during the first year than in earlier years, no doubt due in part to the generally higher standard of secondary education attained by students before entry to Gwebi, particularly in English language, mathematics and science.

"Outdoor teaching" continued as usual, students paying day visits to numerous farms and places of agricultural interest.

The short tour took the second-year students (Course 12) to Grasslands Research Station and to farmers north and south of Marandellas. The theme of the visit to Grasslands was "ley farming in the higher rainfall, sand-veld areas", and special attention was also paid to the work in progress on legume bacteria. On the farms, observation of tobacco, a tobacco fertilizer trial, cattle, pigs, and citrus was linked with the general theme. A close study of office routine and the cash analysis system of bookkeeping was made at one farm; this farm also provided an excellent example of a farm workshop.

The long tour covered mainly heavy soil farms in the Glendale-Bindura-Shamva-Enterprise area. Students were instructed that the exercise would be treated as of a general nature where problems of farming systems, farm planning, farm management and marketing are concerned. Questions were set in final examination papers on the experience and thinking of the farmers visited regarding supplementary crops. A detailed examination of burley tobacco production on a farm scale was made at a farm in the Shamva area.

DEVELOPMENT

Progress was recently made in improving certain aspects of the teaching by making better use of facilities available. Arrangements were made to make fuller use of the general science laboratory for student tutorials and demonstrations. Lecture Hall No. 2 was prepared as a constantly available projection room so that more frequent use can be made of visual aids such as film strips. Two rooms in the engineering and building workshops were improved so that better instruction can be given in the use of maps and aerial photographs, hydraulic pumps, auto-electrics, electrical wiring, switchgear, and so on.

A small acreage of burley tobacco was grown in the 1961/62 season and cured in an implement shed from which the equipment was removed. A slightly larger acreage will be grown in the coming season, and a burley barn (gumpole and thatch) is in course of construction, near the flue-curing barns, to receive the crop.

Otherwise there were no developments of note.

PRODUCTION

Total rainfall was considerably above average being 42.76 inches as compared with a 50-year mean of 32.61 inches. Monthly distribution can be seen from weather details given under the Research heading below. A reasonable rain at the end of October followed by a very wet period from 5th to 15th November and then a drier period to the end of the month provided good planting conditions at the right time. December was a comparatively dry month, but January and February were very wet resulting in a considerable rise in the water table. This focussed attention on the parts of the College farm carrying a wetness factor, and the observations made will be followed up in the future as far as time and funds permit. Light rains occurred in the first half of April but by the middle of the month the dry season, which was to prove a long one, commenced.

The following figures give the facts regarding land utilization and field production on the Gwebi College farm, season 1961/1962:

Crop	*Acres*	*Production*	*Yield per Acre*
Maize grain (Broadbalk)	91	2,283 bags	25·1 bags
Maize grain (Gwebi South)	184	3,368 bags	18·2 bags
Maize silage (Broadbalk)	23	307 tons	13·3 tons
Maize silage (Gwebi South)	10	128 tons	12·8 tons
Dolichos-bean silage	26	132 tons	5·1 tons
Potatoes	8	396 bags	49·5 bags
Groundnuts (unshelled)	17	362 bags	21·3 bags
Soya-bean seed (Gwebi South)	35	201 bags	5·8 bags
Soya-bean seed (Broadbalk)	16	68 bags	4·3 bags
Soya-bean hay	22	—	±1·0 ton
Natal sugar-beans (Mundy South)	8	18 bags	2·3 bags
Natal sugar-beans (Broadbalk)	1	—	3·3 bags
Cotton	plot	—	1,311·1 lb.
Burley tobacco	plot	—	1,291·0 lb.
Virginia tobacco	9	9,304 lb.	1,000·0 lb.

Note.—Bags grain maize = 200 lb. net.
Bags groundnuts unshelled = 65 lb. net.
Bags sugar-beans = 200 lb. net.
Bags soya-beans = 200 lb. net.
Bags potatoes = 150 lb. net.

Silage yields are estimates based on the number of loads, by weight of one load.

The overall yields of maize grain were the highest ever obtained on the College farm. The farm varies greatly in inherent fertility from place to place. For instance, Broadbalk strip E yielded 30.9 bags per acre, whilst strip 5 yielded 21 bags per acre, the other strips ranging between these. On Gwebi South, Lilford South yielded 23.1 bags per acre following a green manure, whilst Lilford North, in its sixth year of continuous maize, gave 18.8 bags per acre; Huggins 2 only yielded 14.7 bags per acre, following a grass ley which was reserved for various engineering demonstrations; late ploughed and inadequately fertilized due to lack of funds.

Potatoes suffered seriously from virus Y and groundnuts from *slerotium rolfsii.* The diseases were doubtless favoured by the high proportion of rainy days in January and February.

The Virginia tobacco gave a gross cash return of £122 per acre as compared with Burley of £160 per acre.

The Friesland dairy herd continued on the high level of production achieved in recent years. Periodic pregnancy tests have revealed a high level of fertility, at 95 per cent., indicative of sound management and absence of disease.

The following figures give overall herd averages, including first calvers:

Year	*Lactations*	*Milk (lb.)*	*Butter-fat (lb.)*	*Butter-fat (per cent.)*	*Days*
1958/59	35	9,457·8	346·25	3·66	291
1959/60	41	9,960·0	354·06	3·61	294
1960/61	24	9,984·8	337·90	3·44	292
1961/62	34	9,872·9	349·74	3·56	299

As a departure from normal procedure the Friesland heifers were wintered in pens or confined to small paddocks. They were fed a maintenance-plus ration of maize silage, stock meal and hay *ad lib.* This system resulted in well grown, robust young animals ready for service and entry to the dairy at an earlier age.

The Hereford herd was supplemented on winter veld with 15 lb. of maize silage per cow per day for early September calving. From mid-August an additional 2 lb. per head per day of a 10 per cent. D.P. stock meal was provided. Calving commenced on 1st September and the stock meal was increased to 3 lb. per head per day from mid-September. The herd is doing well generally and calves from the imported English bull, Wetmore News, are exceptionally good with many show successes to their credit already. Last year's early spring calves (September) weaned out at 441 lb. at eight months of age, compared with 315 lb. for the summer calves (November/December) at the same age, demonstrating yet again the superiority of early calves.

The College continued to support the Litter-testing scheme and the Sow Recording scheme and the results were very satisfactory.

The poultry plant produced 14,383 dozen eggs and 4,929 lb. liveweight of table birds.

The Blackhead Persian flock of sheep is lambed down three times in two years. In this way an annual lambing percentage of 117 per cent. as against the normally accepted figure of 70-75 per cent. is achieved, and both ewes and lambs are in good condition. Lambing sequence has been as follows:

October, 1960—lambed
April, 1961 —lambed
October, 1961—rested
April, 1962 —lambed

RESEARCH

Very little research was carried out, time and funds being limiting factors at the College, where student education has priority.

THE WEATHER, RAINFALL AND TEMPERATURES: 1961/62 SEASON

	July	*Aug.*	*Sept.*	*Oct.*	*Nov.*	*Dec.*	*Jan.*	*Feb.*	*Mar.*	*April*	*May*	*June*	*Total*
Rain, ins.	0·07	0·12	1·81	1·21	9·25	3·47	10·74	10·74	3·17	2·07	0·20	0·00	42·85
50-year mean	0·03	0·07	0·20	1·01	3·87	6·57	7·66	7·10	4·32	1·27	0·39	0·15	32·61
Rainy days	3	2	1	2	15	9	22	17	12	11	3	0	97
Days, ½ in. plus	0	0	1	1	8	5	10	11	3	3	0	0	42
													mean
Mean max. T°	70·0	72·1	80·7	85·3	77·1	79·5	77·7	78·1	77·9	76·9	71·7	74·7	76·8
Mean min. T°	43·7	43·6	49·1	55·2	58·1	59·0	60·3	60·3	55·8	54·3	43·5	40·9	52·0
Mean T°	56·1	57·2	64·3	69·3	66·3	68·1	67·3	67·3	65·4	63·7	56·3	56·3	63·1

Maize Varieties

Thirteen varieties and hybrids were compared. The yields ranged from 22.4 bags per acre for Southern Cross to 40.4 bags per acre for Single hybrid 59H17. The commercial hybrids SRH 10 and 11 yielded 27.9 and 27.6 bags per acre respectively. These were from small plots, carefully looked after, and the results indicate that the field scale yields obtained from nearby Broadbalk are excellent and presumably approaching the maximum field scale yields that can be expected. Single hybrid 59H17 yielded eight bags per acre less than last season. Southern Cross, whilst giving the poorest yield, also had the highest percentage lodging (75 per cent.) and the highest precentage diseased grain (5.8 per cent.). Actually lodging percentage was high in all plots, due to cyclone "Kate".

Effect on Maize Grain Yields of Different Plant Populations, Types and Rates of N

This experiment was in its third consecutive season. The general pattern of results was similar to that for 1960/61 with low yields for no apparent reason and a high co-efficient of variation (16.5 per cent.). Yields varied from 9.2 to 11.3 bags per acre, and there was virtually no result of importance to report.

Lucerne

The dry-land variety trial of eight varieties was in its third year. Due to both loss of stand and vigour the yield was very poor. The results strongly suggest that lucerne without irrigation is unlikely to produce economic yields in this area. After consultation with the Lucerne Committee the experiment was discontinued.

Steer Feeding Trials

Trial No. 4 was completed on 13th October, 1961, with the following grading results for the thirty-five-month old animals.

Breed	*Rhodesia Best*	*Imperial*	*Standard A*	*Final Live-weight lb.*
Nkone	1	2	3	1,018
Afrikander	4	2	—	1,147
Aberdeen Angus	6	—	—	1,088
Tuli	3	2	1	1,055

The object of the trial was to produce good quality young beef as economically as possible and to study such breed differences as might arise. Statistical analysis of the data revealed, as in earlier trials with different breeds, that using groups of six animals each the weight variation within breeds was greater than variation between breeds. Relatively satisfactory maintenance-plus was achieved over the final two winter periods on an economic ration of silage or hay fortified with low levels of urea. The steers were confined for the final three months of the third winter and fed a finishing ration. The summer gain of ±250 lb. per beast is the usual figure expected from College veld grazing. Although costings on a College farm are problematical it is estimated that profit was ± £7 per beast.

Steer trial No. 5 is proceeding.

Poultry

The hybrid breeding project was continued and hatching precentage was particularly high. Losses from leucosis were only 3 per cent., due to rigid culling and contrasting strongly with a loss of 35 per cent. in the Federal Egg-laying Trials, showing that breeders do not pay sufficient attention to the disease. In the California-type laying house (open) a wide range of maximum and minimum temperatures was observed, but despite this production was excellent, confirming the suitability of this type of housing for Rhodesia.

The Lecturer in Poultry was in America studying poultry nutrition and genetics at Davis University, California.

AGRICULTURAL SHOWS

The College again exhibited a considerable string of Friesland and Hereford cattle at Umtali and Salisbury shows, with the addition of some pigs at Salisbury. Student volunteers again assisted with preparing and showing the animals, doing good work and at the same time gaining valuable experience. At Umtali the College won thirty awards and at Salisbury twelve. Noteworthy wins were those for the best pen of five slaughter bullocks at Umtali and for the best grade dairy cow at Salisbury. The Senior Lecturer in Animal Husbandry judged at Bulawayo Show and travelled to the Republic of South Africa to purchase a bull for the College and other animals for the Livestock Improvement Committee.

Despite shortage of staff, the engineering section did a sterling job in making display boards for the Ministry's show exhibit.

COMMITTEE WORK

The Principal was appointed a Federal Government representative on the newly constituted Farm Mechanization Standing Committee, and he also represented the Federal Ministry of Agriculture at meetings of a privately convened committee investigating the establishment of a farm training school near Umtali. The Principal was also asked to attend meetings of the Natural Resources Board Committee studying the organization of practical training courses for young farmers and to serve on a Research and Specialist Services Committee to plan short courses for farmers at the College.

COLLEGE ADVISORY COUNCIL

Mr. E. R. Campbell, C.B.E., was appointed as chairman of the College Advisory Council.

TOTAL REVENUE

During the financial year ending 30th June, 1962, revenue from all sources at the College, including student fees, was £27,972.

CHIBERO COLLEGE OF AGRICULTURE

Steady progress in the overall development of the College was made during the year under review.

STAFF

Appointments

Mr. P. C. Kumalo joined the College staff on the 14th December, 1961, in the post of Warden-Librarian, while Mr. P. S. Charles and Mr. A. S. Mushaninga assumed duty on the 3rd and 20th of January, 1962, as Farm Assistant and Administrative and Executive Officer, respectively.

Mr. I. H. Smillie took up duty as Engineering Instructor on the 26th March, 1962.

As a result of resignations and transfers, the following appointments were also made during the year:

Miss M. D. Palmer as Clerical Officer on the 14th April, 1962.

Mr. A. R. T. Whitmarsh, B.Sc. (Agric.) (London); M.S.A. (Toronto) as Lecturer in Field Husbandry on the 1st July, 1962.

Mr. P. Cheesman as Field Husbandry Instructor on the 16th July, 1962.

Mrs. B. A. Cheesman as part-time Clerical Officer on the 13th August, 1962.

Transfers

Mr. W. F. Hayman, Clerical Officer, to the Department of Income Tax with effect from the 1st April, 1962.

Dr. J. N. Clatworthy, Lecturer in Field Husbandry, to the Pasture Section of Henderson Research Station with effect from 1st July, 1962.

Resignations

Mr. J. McC. Sinclair, Dip. Agr. (Gwebi), Field Husbandry Instructor, on the 30th June, 1962.

Miss M. D. Palmer, Clerical Officer, on the 31st July, 1962.

Mr. P. S. Charles, Farm Assistant, on the 25th September, 1962.

Apart from staff changes indicated, the post of Animal Husbandry Instructor remained vacant for the whole year, despite numerous attempts to find a suitable appointee.

It is a fair comment that the year was difficult for the College staff.

THE COLLEGE ADVISORY COUNCIL

The first appointed Advisory Council continued in office to the 30th June, 1962, when the Minister of Agriculture invited the second Advisory Council to take office for a two-year period.

The highlight of the Council's activities during the year under review was the College Official Opening Ceremony, performed by His Excellency the Governor-General of the Federation of Rhodesia and Nyasaland, the Earl of Dalhousie, G.B.E., M.C., D.L., LL.D., on the 25th October, 1961. Over 400 guests, from all three territories of the Federation, were present, and many were complimentary in their comments about the high standard of facilities provided in the College Tutorial and Administrative, and Hostel blocks, and on the farm.

The chairman of the Advisory Council, Lord Acton, made a personal appeal for donations in cash and kind to the General Purpose Fund, which provides sporting and recreational facilities for the students. The response can only be described as magnificent, and resulted in almost £300 in cash and many very generous donations in kind.

During the year, the Council held two meetings, after which progress at the College was inspected by members.

THE FIELD HUSBANDRY SECTION

The 1961-62 Cropping Season

Seventy-seven acres were sown to crops. There was an interesting similarity between the 1960/61 and 1961/62 seasons, as each had a dry December, followed by a wet spell, and finally a dry period at maize tasselling time. 1961/62 season produced little effective rain between the 15th November and the 9th January, while it also ended on a note of drought, practically no rain falling between the 20th February and the middle of April. In view of this, and the fact that the total effective rainfall for the season was well below the normal for the district, yields of some crops were remarkably good, for example:

640 bags of maize, at a farm average of 15.6 bags per acre, with one strip of 10 acres yielding 19.3 bags per acre.

1,603 lb. of seed cotton, from one acre of the crop, which had been grown as a student practical exercise.

Other crops grown during the season were sunnhemp as a green manure, groundnuts and Natal sugar beans for rations, soya beans, dolichos and velvet beans for silage, hay and grazing, while some 30 acres of old reverted lands were mown for veld hay. Forty tons of good maize/soya bean silage were also produced.

General Development

This was extensive during the year under review. A considerable amount of fencing was erected and this will allow greater control of grazing by all livestock in the 1962/63 season.

Surfacing and realignment of internal farm roads, the planting of two acres of gum trees as the beginning of the afforestation programme, the stumping and rock removal on new lands six and seven, the usual winter land preparations including liming, and the preparation of boundary and internal veld fire breaks, were all significant features of the routine work and development of this section during the year.

The Tobacco Unit

With the appointment of Messrs. Whitmarsh and Cheesman in July, 1962, the proposed tobacco unit was initiated.

A permanent tobacco seed-bed site was established and eight beds were fumigated and fertilized. It is planned to have six acres of flue-cured Virginia, one acre of Burley, and one acre of Turkish in the 1962/63 season, and the necessary seed-bed and land development and preparations were well advanced by the end of

September, 1962. It is confidently expected that there will be no major difficulty to prevent adequate instruction, of all students, in this major cash crop of the Federation.

The Irrigation Unit

During the year an overhead spray irrigation installation, purchased at a price very favourable to the College, was established on some three acres of ground, in close proximity to the College hostel and farm yard buildings. It has been found in practice that the area can be irrigated direct from the very good Nyawiye River borehole, mentioned in last year's report. By the end of the year under review there had been established one-third of an acre of second winter crop irrigated potatoes, one-third of an acre of rape for rations, a permanent grass nursery in one corner of the area and plantings of beans, peas and cabbages.

The intensification of land utilization in the Federation, made possible by such irrigation installations, can now become a permanent feature of the student instruction and teaching.

THE ANIMAL HUSBANDRY SECTION

The Dairy Herd

A year ago it was reported that the nucleus of a Jersey herd had been established at the College.

In the past year generous donations and purchases, the latter again often at a price favourable to the College, brought the herd strength up to:

One pedigree Jersey bull;
ten pedigree Jersey cows, or heifers due to calve; and
six grade Jersey cows.

One pedigree cow died suddenly, during the year, but natural increase in the herd resulted in four bull calves and one heifer calf. It is hoped that possibly one more purchase, followed by the ultimate introduction of the College-produced herd replacements, will maintain the desired numbers. It is not proposed to record here herd production figures for the past year. Milk recording of lactations is now being undertaken and it is hoped that, in the near future, arrangements can be made for the routine determination of dairy tests which will allow full details to be reported next year and subsequently.

The Beef Herd

The past year saw the completion of negotiations with the Minister of Agriculture, Southern Rhodesia, for the provision of foundation breeding stock for the establishment of a Black Polled Mashona herd. In addition, discussions have been held with the Mashona Society and the purchase of a bull through the Society will be arranged in time for the breeding season beginning on the 1st December, 1962. Surplus yearling heifers from the Grasslands Research Station Mashona herd are to be transferred to the College.

Pigs

Two Landrace in-pig gilts, and a Large White boar, were transferred from Gwebi College of Agriculture in November, 1961. This provided the Course 1 students with the practical experience of handling four litters during their first year of the diploma. The first two litters—16 in all—were sold as baconers for an average of over £13 each.

The College has kindly been offered a gift of a young in-pig gilt by Mr. C. G. Tracey and it is proposed to retain the gilts from the litter as additional breeding stock.

A new pig deep litter house was built, while student instruction was also provided by the assembling of farrowing and fattening arks, as designed by the Pig Industry Board.

Sheep

The flock was founded by the transfer of 36 Blackhead Persian ewes from Gwebi College of Agriculture in the previous year, and a ram was received from the same source in November, 1961. One ewe died in October, the carcase being used by the Veterinary Officer to give a post mortem demonstration to students.

The remaining 35 ewes began lambing in mid-April, 1962, and the resulting 29 lambs were weaned in September. In the meantime, a further 25 ewes were received from Gwebi and the flock is now considered adequate for the College's purposes and will be subjected to the usual culling procedure.

Mr. Dallas Kirkman has offered to donate a Blackhead Persian ram from his well known flock. It will be received in the near future and this generous assistance in developing the flock is very much appreciated.

Poultry

The unit was first established in a battery by the purchase of 48 point-of-lay pullets in December, 1961, and these have continued to provide eggs to the time of this report. Subsequently, in early August, 200 day-old chicks were purchased and have been reared in a new poultry brooder house whence they will be moved to a laying house now under construction. A small paraffin incubator surplus to requirements at Gwebi was transferred to the College and will be used for student practical instruction next year. It is anticipated that the Poultry Unit will eventually provide sufficient eggs for the College, all the year round, and also a limited number of table birds, and at the same time afford students adequate practical instructional facilities in what can be a successful and profitable enterprise under good husbandry practices.

General Note

From what has already been reported it will be apparent that very satisfactory progress has been made, in the past year, in the establishment of herds and flocks at the College. With the assistance of the staff of the Department of Veterinary Services who were untiring in their support of College staff to maintain the health of the stock and assist, on a number of occasions, with student instruction and practical demonstrations, it is pleasing to record that the combined efforts of all concerned resulted in a year comparatively free of animal health troubles.

It should also be mentioned that adequate instruction can now be given on the care and maintenance, not forgetting also the profitability, of livestock enterprises, particularly in regard to the small stock which for so long in African agriculture have not received the attention they merit in terms of financial reward.

THE ENGINEERING SECTION

The Engineering Section has contributed, in very great measure, to the development of the other two sections, and the College farm and farmyard buildings as a whole.

The Section itself has as yet no permanent "home" for its activities, but it has nevertheless overcome this major deficiency and contributed outstandingly to the overall rate and progress of development of the College. Some of the completed development work with which it has been closely associated, or for which it has been entirely responsible, over the year under review can be detailed briefly:

The Nyawiye River road bridge crossing; the dairy unit; the workshop implement shed; the farmyard water reticulation layout; the farmyard low tension electrical layout, the spray race and cattle crush; the silage bunkers, the overhead spray irrigation unit; the grain store-milling shed; two cattle grids; the outfitting of the tobacco section electrical installation and borehole; the steel-framed shed in the animal husbandry section, with the completion of bull pens and exercising yards, and calf-pens; the poultry brooder house; and at the close of the year work had commenced on a tobacco handling unit and a poultry laying house.

With the appointment of an instructor, Mr. Smillie, in March, 1962, the tempo of the abovementioned building work was increased considerably, and Mr. Hinton was permitted more time to concentrate on the mechanical and electrical aspects of the work, particularly in regard to student practical work and instruction.

The year under review saw a significant expansion of the equipment at the College and in this respect the Engineering Section showed excellent discretion in choice, and considerable talent in economizing on funds. One example will serve to illustrate this point. An ex C.M.E.D. Landrover truck was purchased for a fair but modest sum and, at little extra cost, was made roadworthy to provide students with basic driving instruction.

It is fair to comment that the first students at the College are benefiting considerably from the fact that much basic development work is still in progress and nowhere is this more evident than in the work of this section.

At the end of the year, plans had been completed for the building of the Engineering Section workshops and offices which, when finished, including fitting out, will provide the very necessary additional facilities to satisfy the practical needs of the three separate courses scheduled to be in residence in the 1963/64 academic year.

EDUCATIONAL

The 1961/62 academic year began on the 1st October, 1961, nine students being admitted to Course 1. During the second term one Nyasaland student returned home for domestic reasons, while the four remaining students from that Territory were recalled by their sponsoring Government towards the end of the third term.

Three Southern Rhodesian students, and one Northern Rhodesian student completed the first year of the Diploma Course and, having satisfied the examiners, were admitted to the second year. N. E. Mumba, of Northern Rhodesia, was the best all round student in practical Field Husbandry, and was awarded the "Fertilizer Industry Bursary".

Despite being based on limited numbers and only one academic year of experience at Chibero, it is considered that the first year of the course, as presently being implemented, has justified the original planning of the three-year diploma.

A significant and important feature of the first year were the 20 "farm visits", carefully planned to provide the student with the very necessary broadened outlook on all forms of agriculture, and to initiate and stimulate constructive thought on the subject. There was clear evidence that this was achieved, and the College is indebted to all those who contributed to the success of these visits, and particularly for the hospitality enjoyed on many of them.

Although small in number the students entered into the usual activities traditionally associated with College life. A Student Association, consisting of a chairman, a secretary and a treasurer was formed early in the year and, with the assistance of staff, a constitution was drawn up and approved. Debates and sporting fixtures were held during the three terms while the weekly film shows were both instructive and entertaining.

At the end of the year it was known that the 1962/63 student intake would be as follows:

	Southern Rhodesia	*Northern Rhodesia*	*Total*
Course 1	3	1	4
Course 2	5	5	10
TOTALS	8	6	14

Despite all the publicity of the aims and objects of the College, it is now quite clear that a vocational diploma training in agriculture has little appeal at present to the average Form IV African student who has no prospect of proceeding to Form VI and University. To attempt to improve this situation, steps were taken during the year to point out to such students the very considerable rewards awaiting those successful in the College Diploma. One can but hope that, in time, the response to the need for such trained personnel will improve.

GENERAL

Visitors to the College

During the year, apart from the official opening ceremony already reported, there were many visitors to the College from within and outside the Federation. Among them were Messrs. Conte and Michel from the Congress of the United States of America; Mr. R. J. M. Swynnerton, of the Advisory Committee on the Development of the Economic Resources of Southern Rhodesia; the African Areas Committee of the Natural Resources Board of Southern Rhodesia; the Federal Standing Committee on Agricultural Production; the African Affairs Board of the Federal Parliament; the Parliamentary Delegation from Nigeria; many Master and Purchase Area farmers from Southern and Northern Rhodesia; pupils from primary and secondary schools in the Federation.

Visits and Meetings

Space does not allow a detailed report on the increased visits, and attendance at meetings, undertaken by the College staff during the year. Mention has been made already of the student farm visits but, in addition to these, the following are some of the other activities under this heading:

The Principal attended the official opening ceremony of the Ford Motor Company of Rhodesia, at which the College was presented with a Dexta tractor, a most generous contribution to the range of equipment, and already proving invaluable in student instruction.

Dr. J. N. Clatworthy attended the Pasture Officers' Conference in Bulawayo.

Mr. Sinclair visited Kutsaga Research Station, by kind permission of the Director of the Tobacco Research Board, from the 15th to the 20th of January, 1962, to gain experience in the reaping and curing of tobacco.

In February, 1962, the Principal undertook the first of a number of school recruiting tours, visiting Gokomere, Morgenster Mission and Zimuto schools in the Fort Victoria area, and Fletcher High School in Gwelo. While in Fort Victoria he also attended the four-day Provincial Agricultural Officers' Conference. Further recruiting trips in Northern and Southern Rhodesia were undertaken later in the year.

The Principal was a final judge of the Earl de la Warr Good Farming Competition, organized by the Natural Resources Board.

All Departmental conferences and meetings were attended by various members of staff during the year, while other conferences, agricultural shows, I.C.A., Farmers' Association and N.P.A. field days and meetings were attended as often as other work commitments would allow.

ACKNOWLEDGEMENTS

I would like to express my appreciation of the efforts of all members of the staff for their loyalty, enthusiasm and hard work, often in the face of disappointment.

I would like as before to mention the close and friendly co-operation between this department and the Department of Conservation and Extension in particular and the efforts continuously made to ensure the most harmonious working of research and extension services. Co-operation with other departments and indeed with other Ministries and even Governments is equally close and friendly, even though, of necessity, it is more discontinuous. The Department continues to face the future with confidence.

B. S. ELLIS,
Director of Research and Specialist Services.

Department of Conservation and Extension Report for the Year ended 30th September, 1962

J. J. DUVENAGE, *Director*

A. INTRODUCTION

Decentralization of responsibilities from Head Office to the Regions continued with satisfactory results.

Programme planning was introduced during the year, emphasis being placed on the collection of facts in each I.C.A., in each Group Area and in each Region. This accumulated information has been carefully examined by the Department's staff and by the I.C.A. committees of their respective areas, for each of which a list of work priorities has been produced. Each of these programme plans has been tailored to fit the needs of the individual area concerned, but at the same time care has been taken to ensure that it conforms as closely as possible to the overall economic and production policy of the Federal Government.

Increases in crop production and the reduction of production costs are goals for which the Department is continually striving. There is no doubt that they will be achieved and that the recent fall in the price of maize has stimulated a great deal of interest among farmers in improving their efficiency as producers. The beef industry will move on to a sounder basis also when the Beef Recording Scheme introduced by the Department is widely adopted. Costings clubs introduced by the Department this past year, although still in their infancy, promise well, but will have to receive widespread support and encouragement if they are to make any significant progress in helping to reduce production costs. It is becoming apparent that the study of whole farm costings must be integrated with time-and-motion studies as well as with what is being accomplished in the field of agronomic research, in order to make the best possible use of the knowledge that is available. The need for such integration and co-ordination of effort generally is essential if the Federal Government's agricultural policy is to be satisfactorily carried out.

The Department's investigations into vlei drainage have now reached the point where the agronomic aspects must be studied so that the vast areas of wet-land can be utilized effectively without detriment either to the soil itself or to water supplies. This matter is also dealt with under items C 2 (d) (iii) and D 6.

There is a lack of knowledge and appreciation of the role that closer settled areas and tenant-farming schemes could play in the Federation. This is a field that largely remains to be explored. It is interesting to note here, however, that the Vuti Settlement Scheme, established in terms of the creation of a new land class known as "Unreserved Land", embraces farms of comparatively small size which have been allocated on a closely settled basis to provide for farmers of all races who have insufficient capital to qualify for normal Crown land farms.

The Department has met the challenge presented by this new development and is now responsible for providing extension advice in these Unreserved Land areas.

B. GENERAL

B.1. *Organization of Staff*

The past year was a difficult one in that the Department lost 18 professional officers due to resignations. Recruitment was not easy for various reasons and it was necessary to have a senior officer visit the universities of the Republic of South Africa in an endeavour to stimulate interest among undergraduates in taking up a career in the Federal Ministry of Agriculture on qualifying. This tour of universities was moderately successful.

Because of the general staff shortage it proved impossible to provide the service to I.C.A. committees and farmers which has come to be expected of the Department. During the year a Public Relations Officer was attached to the Ministry of Agriculture from the Federal Department of Information, and he has worked in close collaboration with this Department since his arrival—being based with Headquarters staff in Salisbury. In addition an Apiculturist was appointed and seconded to this Department in July from the Department of Research and Specialist Services.

As a result of the increased interest shown throughout the Federation in Burley and Turkish tobacco production, Burley and Turkish Extension Officers' posts were created and filled.

Upgradings during the year under review were as follows:

(i) Senior Conservation and Extension Officer.
(ii) Chief Irrigation Officer.
(iii) Officer-in-Charge of Work Study.
(iv) Assistant Librarian.

New posts authorized during the period covered by this report were:

Branch I

(i) One Regional Conservation and Extension Officer (Southern Rhodesia).
(ii) One Training Officer.
(iii) One Planning Officer.
(iv) One Farm Building Adviser.
(v) One Conservation Officer (Southern Rhodesia).
(vi) One Turkish Tobacco Extension Officer.
(vii) One Burley Tobacco Extension Officer.

Branch III

(i) Four Clerical Assistants Grade II for the following offices:
  One in Mashonaland Regional H.Q.
  One in Chisamba Group Office.
  One in Kalomo Group Office.
  One in Eastern Regional H.Q.
(ii) Two Conservation Assistants to work as follows:
  One at the Chipinga Experiment Farm.
  One as a Scribe in Mashonaland Region.

Branch IV

(i) One Engineer Assistant, Grade IV.
(ii) One Field Assistant, Grade II.

B.2. *Visits to Other Countries*

The *Senior Conservation and Extension Officer*, Mr. J. C. Harper, spent approximately two weeks in the United Kingdom on the conclusion of his U.S.A. tour in October, 1961, visiting various large tobacco organizations in Bristol and Nottingham and studying other matters of agricultural interest at the Universities of Cambridge, Oxford and Nottingham. Weed control and farm management were two specific aspects covered during this brief tour.

The *Chief Tobacco Extension Officer*, Mr. R. Hope, visited Greece, Turkey, Italy, Switzerland, Western Germany, the United Kingdom, U.S.A. and Canada during the period May to September, 1962, to study different aspects of aromatic burley, cigar wrapper leaf and flue-cured tobacco production. This visit was made possible through the generosity of the Archie Henderson Memorial Trust.

Group Conservation and Extension Officer, Mr. J. W. Hayward, through the co-operation of and with financial assistance provided by the Food and Agricultural Organization in Rome, spent approximately a month in New Zealand in August/September, 1962, before proceeding to Australia for a tour of places of agricultural interest in certain territories of that country.

The objects of Mr. Hayward's visit were, among others, to study methods of developing new areas, the land-tenure system, land-use planning and layout in relation to new areas, livestock production, veld and pasture management, certain aspects of dairying and the organization of the New Zealand and Australia extension service.

Advisory Horticulturist, Mr. O. H. Jones, visited Kenya and Tanganyika during January, 1962, to study coffee production in those two territories in relation to the development taking place in this field in the Eastern Districts of Southern Rhodesia.

The *Irrigation Officer*, Mr. H. N. Orner, completed his tour of the U.S.A., United Kingdom, Netherlands, Israel and Sudan, studying various aspects of irrigation to which reference was made in the Department's annual report for the year ended 30th September, 1961. This tour was made under the auspices of the International Co-operation Administration (now known as the agency for International Development).

The *Chief Planning and Training Officer*, Dr. V. Vincent, and the *Senior Planning Officer*, Mr. H. R. Hack, attended a land-use planning seminar in Pretoria and participated in visits to farms in the Western Transvaal arranged for the delegates.

The *Senior Training Officer*, Mr. D. E. Baker, represented the Federal and Southern Rhodesia Territorial Governments at a conference on extension methods held at the F.A.O./C.C.T.A. Agricultural Extension Development Centre in Arusha, Tanganyika, in February, 1962.

The *Director*, Mr. J. J. Duvenage and *Chief Planning and Training Officer*, Dr. V. Vincent, attended a conference of SARCCUS (Southern Africa Regional Committee for the Conservation and Utilization of the Soil) in the Bechuanaland Protectorate in April, 1962.

The *Chief Planning and Training Officer*, Dr. V. Vincent, visited various universities in the Republic of South Africa recruiting staff for the Department. Two such recruiting tours were made—one in October, 1961, and the other in August, 1962.

The *Senior Agricultural Topographer*, Mr. R. G. B. Jones, attended a course of a month's duration in January/February, 1962, at the International Training Centre in Delft, Holland, on photo-interpretation of geomorphological characteristics.

The *Senior Farm Management Officer*, Mr. G. B. Thorpe, attended a course given in May, 1962, by the South African Economics and Markets Division in Pretoria for South African Field Extension Officers.

The *Senior Work Planning Officer*, Mr. B. W. R. Wilson, went to the United Kingdom at the end of September, 1962, to participate in a Work-study Course at Seal-Hayne Agricultural College, Newton Abbot, Devon.

Conservation Officer, R. C. Hannington, participated in a course of two months duration at the International Training Centre, Delft, Holland, on the Use of Aerial Photography in Land Classification. The course started in September, 1962.

B.3. *Representation on Committees*

The Director and Deputy Director served on many committees during the year which are listed in the form of Appendix I to this report.

B.4. *Publications*

Officers of the Department wrote a number of articles for publication during the year, the more important of which are listed together with those of other staff members in Appendix II.

C. SPECIALIST ADVISORY SERVICES

C.1. *Planning and Training Branch*

a. Land-Use Planning

Aerial Photography.—The Department's flying vote was drastically cut from £4,750 to £1,425 which meant that no flying could be done in Southern Rhodesia and only a limited amount in Northern Rhodesia. Areas flown this year were: Kalomo I.C.A., Zimba I.C.A., portion of Choma I.C.A., and the Chalimbana Experiment Station.

The Department's proposals to have one-fifth of the country flown annually by pooling the votes of all interested departments, received very sympathetic support from both the Federal and Territorial Treasuries. It is anticipated that in future aerial photography will be put on to a national rather than departmental basis. Should this come about the Department's requirements will be well met.

Special Land-Use Assignments.—A great number of special land-use assignments were carried out by the Planning Section during the year. Agencies requesting this assistance and brief details of the exercise in each case are given below:

Department of Native Agriculture.—Land-use assessment of Lancashire and Wiltshire Estates—an area of 600,000 acres.

Land Settlement Board.—Dam site survey of the Vuti Block—80,000 acres.

Republic of South Africa.—Photo-interpretation of 20,000 acres in Natal.

Kariba Lake Co-ordinating Committee.—Stereoscopic reconnaissance of the Zambezi River, from the Victoria Falls to the headwaters of Kariba Lake.

Department of Veterinary Services.—A detailed drainage assessment of 140,000 acres of lowveld in the Shangani Reserve north of Bubi I.C.A. This exercise entailed the delineation of a diffuse drainage pattern to determine possible movements of tsetse-fly.

Department of Veterinary Services.—Stereoscopic assessment for the siting of a foot-and-mouth control fence of an area extending from the junction of the Ramaquabane and Shashi rivers to the junction of the Shashi and Tuli rivers.

Unreserved Land Board.—Land-use assessment of 40,000 acres for subdivision purposes.

Southern Rhodesia Department of Native Agriculture.—Land-use planning in native purchase areas and portions of native reserves.

Federal Ministry of Education.—Lectures and tours for two schools on land-use and ecology in Southern Rhodesia.

Land Settlement Board, Southern Rhodesia.—Land classification and sub-division of Rhodes Matopos Estate (Sauerdale).

Natural Resources Board of Southern Rhodesia.—Compilation of data on the soils of the Great Dyke.

National Parks Board.—Preparation and annotation of mosaics for the National Parks Board.

Departmental Special Assignments included assistance to the Mashonaland Region in farm-planning five farms in Salisbury South I.C.A. and to Northern Rhodesia, where a similar undertaking was carried out in Broken Hill and Mazabuka I.C.A.s.

Land Classification.—The Pedologists attached to the Department again made every effort to maintain standards of land classification carried out by field staff and made a number of visits to the various regions.

A punch-card system for recording soils information obtained through land classification was designed.

Vegetation Classification or Assessment.—Owing to a number of contentious points raised by various specialists and the Department's field staff regarding the validity of vegetation transects for the assessment of behaviour trends in veld, the whole subject was reassessed during the year. Specific exercises involving trial transects of different types of vegetation were also carried out. There is obviously a pressing need for a system of vegetation assessment which will—

(i) give a factual picture of the composition of the vegetation within any homogeneous area;
(ii) determine a "base line" for the assessment of trend over the seasons;
(iii) give guidance to field staff as to carrying capacities which may be planned within any given paddocking system.

A high-level interdepartmental pasture and veld conference was held in Bulawayo in January at which the entire subject of veld management, carrying capacities and vegetation surveys was fully discussed. However, no final conclusions were reached and the matter is still receiving attention.

Initial Development Planning.—Initial Development Plans were prepared for 68,375 acres of Crown land farms. There is a possibility that the Department might be able to modify and improve its approach to the preparation of these plans in consequence of a review of this work at present being undertaken.

Farm Planning.—Although improvement in output of farm plans was slight, overall progress in this field was better during this past year than in the preceding twelve months. This is a significant achievement especially when it is remembered that—

(i) there is now a more limited area from which the demand for farm planning can come;
(ii) there are now fewer co-operative farmers; the most co-operative have already had their properties planned;
(iii) the last season was a difficult one which made farmers reluctant to outlay any money whatsoever;
(iv) there has been a greater demand for the implementation of existing plans, which has increased the demand on Extension Officers' time.

In spite of these factors the demand for farm planning remains high throughout the country, the majority of I.C.A.s having accorded it top priority in their programmes for the coming year.

Farm plans produced in the various Regions during the last four years are shown in the following table:

	Plans Completed				*Acreage Classified*
Region	*1961/62*	*1960/61*	*1959/60*	*1958/59*	*1961/62* *acres*
Mashonaland	164	141	176	232	435,860
Midlands	50	58	116	169	268,182
Matabeleland	76	46	57	82	887,100
Eastern	49	32	44	83	245,052
Sabi Team	27	60	47	65	71,967
TOTALS	366	337	440	631	1,908,161

Up to the end of September, 1962, 2,060 farm plans were completed in Southern Rhodesia, covering 9,707,222 acres. Stage 2 planning in Northern Rhodesia (i.e., farm planning), has not made comparable progress because nearly all the activity in this field in that Territory has been concerned with Regional Planning. Seven farm plans were completed in Northern Rhodesia during the year.

Regional Planning.—During the year a further nine Regional Plans were completed in Northern Rhodesia. Progress was not as rapid as anticipated and five plans have still to be done before the whole exercise can be regarded as complete.

Catchment Planning.—The Sabi Catchment Planning team's output was the poorest since the start of the Sabi Catchment Scheme in 1957. Staff difficulties and vacancies resulted in a reduction of potentially productive days from 73 per cent. last year to 48 per cent. this year and a marked slowing down of progress towards the goal of stabilizing the soils of this large and important area.

The result of a major effort in the European areas of the catchment has been to ensure stability over half of the catchment while the other half (African areas) remains little better from a conservation point of view than it was when the whole scheme was initiated. The major problems to be solved prior to the construction of national storage works in the Condo catchment lie mainly in the African areas.

b. TRAINING

General

A great deal was accomplished by the Training Branch during the year, no less than 44 National training sessions being held, with a total attendance of 1,072 people from various fields of work. Eighty-two per cent. of this Department's staff received training of one sort or another.

Four new courses developed during the year were those concerned with Tobacco Training, Extension Methods, Farm Management and Young Farmers' Clubs Administration.

Induction Training

Twenty recruits received induction training which involved field training and three formal courses, i.e. Course I (Mechanical), Course II (Biological) and Course III (Farm Planning). These three courses involve 10.6 per cent. of an officer's work time.

While initial evaluation of induction training indicates its success, there is need in future to follow up in the field to locate strengths and weaknesses.

Extension Programme Planning

Demands made upon the time of field officers continue to rise. In order to enable them to concentrate on priority needs, rather than scratch the entire field programme planning was introduced in 1961 and has become an intimate part of induction and extension methods training. This new approach holds great promise and has undoubtedly resulted in many officers having a much clearer picture of their areas, and of their short- and long-term objectives.

A list of formal training sessions organized by the Training Section in co-operation with specialists is attached to this report as Appendix X.

Youth Extension

Youth extension work in certain fields has shown positive trends in that Conservation Education in schools is developing steadily and positively under the leadership of the Natural Resources Board. Unfortunately the Young Farmers' Club movement has not made the progress that had been hoped due, primarily, to the critical shortage of voluntary and professional leaders.

A specific review of the Young Farmers' Clubs Organization is currently being undertaken.

c. WORK PLANNING

General

The efficiency of the Work-planning Section was seriously affected during the year but despite this fact a great deal of useful work was done. Main duties were confined to—

(i) the collection of data by modern work-study techniques on methods of work for various operations and crops—this was still mainly confined to tobacco;

(ii) the utilization of existing data by providing specialist advisory service to farmers on the use of efficient work methods;

(iii) the training of Tobacco Extension Officers to help disseminate information regarding the findings of specialists in this particular field.

Advisory Work with Farmers

A total of 1,426 visits to farmers was made during the year and, of these, 217 or 15.4 per cent. were study visits. The character of these visits to farmers changed during this period. At the start they were mainly introductory, but as the officers became better known and the result of their work was appreciated, a higher percentage of the visits was made at the specific request of farmers.

The policy of visiting the "Demonstration Growers", to whom preliminary manuals were issued, has been continued, and it is encouraging to note that a high proportion of these farmers remain keen and have adopted work-study recommendations.

In the areas having a full-time officer, approximately 25-33 per cent. of the growers were visited. Of these growers who were visited, it is estimated in one area that 70 per cent. are reasonably interested and 15 per cent. really keen.

A total of 79 discussion groups on work planning were organized by the Department during the year and attended by 1,105 farmers.

Future Outlook

Where the future is concerned, the setting up of a proper farm-management section with economists and work-planning officers on full-time investigations should be the eventual aim. At present the section is divided between extension and research.

d. Farm Management

General

During the year a policy statement in respect of Farm Management Advisory Services was issued. The implementation of this policy, which it is proposed to accomplish by 1964, is very flexible to allow for its adoption by field staff in a way best suited to meet local needs and to fit in with existing circumstances.

Throughout the year two vacancies for Economics and Marketing Branch staff (to be seconded to Conservation and Extension) remained unfilled. In fact one Economist was for part of the year held in the Economics and Marketing Branch against one of these vacancies—an unsatisfactory state of affairs.

Farm Management Advisory Services

Farmers in the cropping areas where incomes from tobacco and maize are becoming increasingly difficult to maintain, have shown a ready appreciation of the benefits likely to accrue to them from co-operation in the comparison of farm records. In purely ranching areas the discussion group approach should be confined to livestock records for guidance on breeding, culling and grazing, and, in the case of under-developed ranches, on practicable rates of herd increase. A trend survey on the last aspect should be undertaken when specialist staff are available.

Pressure of work prevented the completion of case study work. In the foreseeable future this will be undertaken only by new staff as training exercises. Technical adaptations of survey results from discussion groups, and individual farm analyses carried out by field staff, will have to serve as the basis for production models in the meantime.

Personal assistance along case-study lines was given to only one farmer during the year, specifically to gain experience in tractor-work (recording gallons of fuel used) and because Burley tobacco is of interest. It is proposed to continue this assistance during the coming year.

Training in Farm Management

Training of field staff was given the highest priority and three courses of five days each, and six of two days each, were run. Training received by the Senior Farm Management Officer on a five-day course on extension methods and on a ten-day visit to Pretoria was directly related to this training of field staff, as was the time spent with the individual officers in their home areas. The follow-up with the officer in his own area was probably of greater direct benefit than were the formal courses.

The subject of the follow-up courses in 1963 is the correlation of management data and the interpretation of anlayses.

C.2. *ENGINEERING*

a. Farm Buildings Section

Creation of the new Farm Buildings Adviser post considerably strengthened the section's activities. However, the demand for advice still far exceeds the capacity of the staff to provide it.

Flue-cured Tobacco Buildings

Much advice has recently been given on the construction of flue-cured tobacco barns and ancillary buildings. Approximately 2,000 additional barns are being constructed, mainly because of the large quantity of leaf thrown away last year. This number is, however, an estimated 6,000 barns short of national requirements.

As a result of the Rhodesia Tobacco Association's publication of work-study, farmers are becoming very conscious of the need for efficient layouts and requests for advice on how best to alter and improve existing buildings are frequently received.

A low type of barn (3-4 tier) is now being tested with the object of increasing handling and curing efficiency and also with a view to its use as a multi-purpose shed after curing.

Burley Tobacco Buildings

A publication was produced on the construction of Burley tobacco barns, and a study will be undertaken during the coming season to find out how best existing designs can be improved. Industry is becoming interested in producing steel or concrete structures for Burley curing.

Maize Storage

Ever-increasing interest is being displayed in the bulk storage of maize on the farm, and as a result two types of bin are at present under test at the Grain Marketing Board's Aspindale site and the Pig Industry Board farm.

Other Crops

In conjunction with the Pig Industry Board and various industrialists, soyabean cookers have been developed for pig producers. Extensive trials have also been carried out on a prototype crop drier and plans are now in hand for a full-scale drier to handle 3-4 tons of dried material per batch.

Small-scale Farms

Indications to date are that the people on farms in the Unreserved Areas will need much closer guidance and more supervision than have been necessary in other areas in the past. In addition, special requirements will have to be met in the buildings field. For these reasons it is desirable that research should be started as soon as possible into the problems that are known to exist in this sphere.

Liaison with Industry

Local industrialists have been encouraged to enter the agricultural field and considerable progress has resulted to the benefit of both the farming community and industry as a whole.

Research

Limited funds were provided during the year which it is intended to use for research on Burley tobacco barns, bulk maize storage and brick-making methods.

b. Farm Machinery Section

The Farm Machinery Engineer's post was filled at the beginning of 1962, after having been vacant for nine months. The incumbent spent the first few months after his arrival in gaining knowledge of local conditions and has only recently become really active in extension and development work.

Groundnut Machinery

Two makes of planter were tested during the year with a view to obtaining optimum plant populations by planting twin rows on the ridge. Both planters met the requirements, one of them being particularly successful.

Further trials were done with a lifter/shaker, lifters and a picker, and more are to be carried out during the coming season in order to obtain more conclusive results. It is also intended to develop a system of planting four rows on a wide ridge or bed.

Maize

Combine harvesters are now being used in some maize areas and farmers are able to have their maize crops harvested and shelled by contract.

A machine capable of applying insecticide to maize seed at planting time was developed in conjunction with entomologists of the Department of Research and Specialist Services. This machine was developed especially to combat root-worm which has become a serious menace to maize crops in certain parts of Northern Rhodesia.

Sunflower Harvesting

A combine attachment is now available which makes harvesting of sunflowers a simple, fast job.

Research

Research in and development of tillage and farm machinery are necessary to meet the agricultural industry's special needs and problems. To do this work effectively, it is essential that a research centre should be set up at Henderson Research Station.

c. Conservation Advice

Advice, guidance and instruction were given to field officers and others on dam siting, design, construction and maintenance problems and on erosion control and reclamation works. Advice was also given on the use of machines for earth-moving and bush-clearing work.

In gully and spillway protection some use has been made of gabions and this is likely to increase considerably in future.

d. Research

(i) erosion control at henderson research station

General Progress

The streamlining of the research programme and the appointment of additional staff, which were reported in the last annual report, have led to more efficient operation.

During the year under review, emphasis was placed on laboratory studies of nutrient losses in which field very good progress has been made. The study of the mechanics of erosion and the development of the rainfall simulator have received less attention.

Changes in Programme

No new field experiments were started and all the present experiments continued unchanged. A new emptying and recording procedure will be used in the 1962/63 season. For the first two seasons only annual soil and water losses were recorded, while for the next seven years measurements were made after every storm. This has given enough data on individual storms and in future only annual losses and exceptionally severe storms will be noted and measured.

Rainfall Simulator

Progress has been disappointing. The work of developing the laboratory prototype into a practical field-model has been spasmodic with many interruptions. The present stage is the field testing of a design which, if successful, will be fairly close to the final version.

Fertility Losses

All the analyses of eroded soil samples have been finished and the results have been computed. The Research Officer is now correlating the work at Pretoria University and preparing the results for publication.

Evapotranspiration Project

This project has remained on a care and maintenance basis. The crops are grown and the lysimeters and other equipment maintained, but no recordings are taken. Some study has been made of the high water-table which is an unexpected feature of the site. This limited programme will continue until such time as a proper team can be assembled to operate the project fully.

(ii) other projects and advisory work

Catchment Research

Several joint projects are being operated on or are being investigated with the Hydrological Co-ordinating Committee. Full recording of a number of catchments in the Sabi River basin and the grazing run-off experiments at Matopos will continue with the coming rainy season.

Investigations are also being made of possible experimental catchments on Lancashire Estate, in the Shashi Reserve and on the Tuli Experiment Station.

Advisory Experiments (Regional)

The run-off experiments in Odzi, Marandelles West and Wenimbi I.C.A.s continue unchanged. In the Bembezaan I.C.A. the gully control experiments have carried on, work being limited to maintenance and minor changes. Sites have been chosen on Devuli Ranch in the Sabi I.C.A. to measure the amount of erosion taking place near dips and boreholes. These experiments will start in the coming season.

Advisory Experiments (Other)

Further assistance was given to the officers controlling the experiments operated by the Nyasaland Department of Agriculture and the Tea Research Association, which are designed to measure run-off and erosion under various forms of land protection on tea estates.

(iii) DRAINAGE

Progress was made in carrying out the basic plan of establishing a broad coverage of experiments on a wide range of soil types. A few new sites were added but the main task was the installation of additional measuring and recording instruments for more detailed study of some of the existing sites. A little progress was made in the study of catchment hydrology, a continuously recording evaporimeter having been designed which is now in operation.

Field permeability tests indicate that much more research is needed into this sector of the work if any attempt is to be made to correlate existing information in this field with other findings. Laboratory testing and analyses of soils, like the processing and analysis of all accumulated data in possession of the Erosion Research Branch, are in fact to be undertaken soon.

The stage has now been reached where it is very necessary to start agronomic studies on the use of drained land—an essential phase which, it is calculated, will yield a great deal of basic information of direct use to farmers.

C.3. *TOBACCO ADVISORY SERVICE*

a. Staff

Two new posts of Burley Tobacco Extension Officer and Turkish Tobacco Extension Officer respectively were created and filled during the year, increasing the specialist staff of the Tobacco Branch to five officers. In addition there are 50 other officers trained in tobacco advisory work of which 38 are at Group and Conservation Officer level and six at Regional level. The remaining six tobacco-trained officers are in the Planning and Work Planning sections of the Planning and Training Branch.

During the year there were eight resignations by officers trained in tobacco, most of whom went farming.

b. Training

The system of in-service tobacco training, instituted for the first time during the season under review, proved a success and is being continued during the 1962/63 season with the training of a further 12 officers, eleven of whom are from this Department and one from the Northern Rhodesia Department of African Agriculture. A further two officers have also been placed on farms for the season.

Three officers attended an In-service Turkish Tobacco course at Mushwishi, near Broken Hill, arranged by the Northern Rhodesia Government.

c. Analysis of Visits

An analysis of work carried out by officers trained to advise on tobacco is given below:

	1961/62	*1960/61*
Farm visits	8,909	5,722
Tobacco Research Board visits	507	472
Grading sheds	11	37
Miscellaneous	547	673
	9,974	6,904
Farmers' Days and Discussion Groups	378	316
Attendances	5,793	4,683

There has been a 64.2 per cent. increase in the number of farm visits made by Tobacco Advisory Officers over those carried out the previous season. This is directly due to the increasing number of officers being trained to advise on tobacco and illustrates the wider coverage of operations and increasing impact of the Tobacco Extension Service on the farming community. The increased number of farmers' days and discussion groups which were held and the attendances also serve to emphasize this point.

Of the 8,909 farm visits made, 3,092 (34.7 per cent.) were at the specific request of the farmers concerned. This percentage is considerably lower than in previous years, due to many non-request visits made to farmers by in-service trainees to increase their knowledge of the crop.

d. COMMERCIAL GRADING

Visits to inspect grading sheds in the South-Western Area are made only at the specific request of the South-Western Tobacco Marketing Board, as it now employs a commercial grading inspector. The grading shed at Fort Jameson, however, is still inspected regularly at the request of the North-Eastern Tobacco Marketing Board.

e. TOBACCO RESEARCH BOARD

The very close liaison with the Tobacco Research Board which has been built up over the years with such mutual benefit was maintained and is much appreciated. Regular visits were made by the Department's staff to the Board's research stations in both Southern and Northern Rhodesia.

The staff of the Tobacco Research Board continued to play a major part in the in-service tobacco training programme.

f. FIELD TRIALS

Co-operative off-station trials were conducted in conjunction with the Tobacco Research Board as in previous years.

g. RHODESIA TOBACCO ASSOCIATION (TOBACCO EXPORT PROMOTION COUNCIL OF RHODESIA AND NYASALAND AND SOUTH-WESTERN TOBACCO MARKETING BOARD)

A very close liaison was maintained with these organizations. The South-Western Tobacco Marketing Board's senior classifiers organized a successful series of classification courses in flue-cured tobacco during the year for farmers in Northern Rhodesia.

h. CENTRAL AFRICAN TURKISH TOBACCO ASSOCIATION

The Senior Tobacco Extension Officer continued to serve on this Council as a co-opted member representing European growers in Northern Rhodesia.

i. CO-OPERATION WITH OTHER GOVERNMENTS

Close co-operation was maintained with the Departments of African Agriculture of both the Northern and Southern Rhodesia Governments.

j. VISITORS FROM OUTSIDE AND WITHIN THE FEDERATION

Four visitors from Madagascar were placed with tobacco growers for short periods. Itineraries for visits to places of interest from the tobacco production and manufacturing aspects were arranged for two parties of African tobacco farmers from both Rhodesias.

C.4. *PEST AND WEED CONTROL SERVICE*

a. INSPECTIONS

During the year 5,353 inspection visits were made by members of the Branch to tobacco premises and farms. Of these, 198 were for the specific purpose of noxious weed control.

Three inspections were made of the tobacco tranship sheds in Beira. On two of these visits infestations by the cigarette beetle, *Lasiorderma serricorne*, were found to be present in three consignments of tobacco. The cleanliness and insecticidal treatment of the sheds were found to be satisfactory on each occasion.

In addition to these inspections, a visit, at the request of the Tobacco Trade Association, was made to Beira for the purpose of investigating what duties an Inspector could perform after the installation of the new vacuum fumigation plant. Thirty-four visits were also made to the Salisbury industrial area for the purpose of examining tobacco for export, issuing phytosanitary certificates, checking on insects found in tobacco or tobacco premises and carrying out routine checks on premises after and during fumigations and insecticidal treatments.

b. PROSECUTIONS

Twenty-six successful prosecutions were made against farmers who had failed to comply with the requirements of the Plant Pests and Diseases (Tobacco) Regulations.

c. PESTS

Infestations by the cigarette beetle, *Lasioderma serricorne*, were found on 16 occasions in tobacco premises. In all these cases successful control and eradication measures were carried out.

d. Minor Irregularities

In addition to those mentioned under (b) there were a large number of minor contraventions of the regulations. The main ones concerned volunteer and regrowth tobacco plants found in lands and seed-beds, and tobacco rooms not cleaned out and limewashed by the required date.

e. Noxious Weeds

Eichornia crassipes was found to be present in the Makabusi River; Lake McIlwaine, Hunyani River below the Lake McIlwaine spillway and for two or three miles down the river; Mangula dam and the Hunyani River in the Silverside and Gombera farm areas; Muneni River; Nyanula River; Tsungwesi River; Virginia "A" and Alma farm dams and in a garden fishpond. The Department of National Parks is now undertaking the control and eradication of this weed in the Makabusi River and Lake McIlwaine.

Salvinia auriculata was found to be present in the Prince Edward Dam; Chimbi River on Harleigh, Glentarg and Drift farms; Chimedza River on Virginia "A" farm; Shemara, Valleyfields and Riverdene farm dams and in two fishponds—one in Angwa South I.C.A. and the other in the centre of Salisbury. The infestations are being dealt with.

Lantana camara. This weed was declared a noxious weed in Southern Rhodesia during the year. Efforts are now being made both in Southern and Northern Rhodesia to control and eradicate the weed.

f. Programme for 1962/63

Every effort will be made during the coming year to increase still further the efficiency of the Pest and Weed Control Service by in-service training. Arrangements have been made to hold a course in December, 1962, for the members of this Branch with this particular end in view.

C.5. *IRRIGATION ADVISORY SERVICE*

During the year Irrigation Officers in both Territories made 275 visits to farmers to advise on irrigation matters, travelling over 34,000 miles during the course of their duties.

Farmers continue to show great interest in irrigation, a state of affairs borne out by the fact that water right applications involving 6,000 acres were made during the year. Considerable stimulus has been given to irrigated lucerne and fodder crop production in consequence of the development that has taken place in the beef industry. The very good results obtained over the last few years with new, locally bred wheat varieties grown under irrigation in winter, have highlighted the potential that exists for such grain production in the two Rhodesias. Expansion in this field will be comparatively slow, however, until farmers are convinced that the economics of producing wheat and barley are sound.

A very important factor responsible for the expansion of the acreage under irrigation in this country is the increasingly widespread use that is being made of overhead spray equipment. There is no doubt that farmers find this method of water application far simpler than the more conventional flood methods and that it has special appeal where rural electrification facilities are available. At present about half of all farmer-irrigation schemes are irrigated by means of overhead spray equipment.

On the whole there has been a decrease in the acreage of crops grown under supplementary irrigation. This is particularly true in the case of tobacco.

As a result of Mr. H. Orner's visit to the United States of America and investigations carried out by the Department in this country, further progress was made during the year in adapting new methods of irrigation to local conditions. Trials carried out with trickle flows of water in compacted corrugations, for example, gave most satisfactory results and will be followed by additional tests.

Acreages under irrigation in the European farming areas of the two Rhodesias is estimated to be as follows:

Area	*Acres*
Matabeleland Region	7,200
Midlands (excluding acreage under sugar-cane)	8,600
Mashonaland East and West	10,000
Eastern	11,000
Northern Rhodesia	4,450
	41,250
Acreage under sugar-cane:	
Midlands Region	20,350
Zambezi Valley	3,000
TOTAL	64,600

C.6. *APICULTURE*

a. GENERAL

The appointment of an Apiculturist on the 11th July to work with the Department of Conservation and Extension on secondment from the Department of Research and Specialist Services, aroused a great deal of interest in that it satisfied a need long felt among beekeepers. Since taking up her duties the Apiculturist has been hard-pressed to cope with the innumerable calls made upon her to guide and advise individual producers of wax and honey and she has had, of necessity, to devote the majority of her time to groups of beekeepers. No less than 37 addresses and/or demonstrations on apiculture were given by the Apiculturist to gatherings of beekeepers throughout Southern Rhodesia during the period of two and a half months since her appointment. In addition, 76 demonstrations were given to small groups of up to three people.

b. PROBLEMS THAT CONFRONT THE BEEKEEPING INDUSTRY IN RHODESIA

Absconding swarms constitute a very real problem in the Federation and is one to which a solution has yet to be found. The need to develop a bigger and more docile strain from indigenous Rhodesian bees is apparent and it might well be possible, were attention to be devoted to this matter, to breed a strain of bees that would be equal to some of the best available in Europe.

Due to ignorance many mistakes have been made by beekeeping enthusiasts in the past which could have been avoided had expert advice been available. It is hoped that many of the problems engendered by these mistakes will soon be overcome.

c. FUTURE OF THE BEEKEEPING INDUSTRY IN RHODESIA

The potential for beekeeping in Southern Rhodesia appears to be great, both on a commercial and non-commercial basis, and every effort will be made in the years that lie ahead to realize this promise. An important step in this direction is the construction on Henderson Research Station of a beehouse which it is hoped to have ready for use before the end of 1962. Such a building will constitute a powerful demonstration aid.

By the end of the period covered by this report the Apiculturist had not had an opportunity of visiting Northern Rhodesia which, it is thought, has a potential for honey and beeswax production comparable to, if not greater than that which exists in Southern Rhodesia.

D. SOUTHERN RHODESIA

D.1. *ORGANIZATION AND STAFF*

Because of the steady intensification of agricultural activity in Mashonaland as a whole, it became necessary to divide this vast area into two separate Regions during the year, the one being called Mashonaland West and the other Mashonaland East, both with headquarters in Salisbury. Mr. G. E. Rowe, the Additional Regional Conservation and Extension Officer of the Midlands Region, was promoted to Regional Conservation and Extension Officer to take charge of the new Mashonaland West Region. He will in due course, when funds become available, move his headquarters to Sinoia.

The 98 Intensive Conservation Areas into which the European settled parts of the Territory have been sub-divided, continued to receive the best possible help from the Department under difficult circumstances engendered by severe staff shortages in the field. Close liaison between individual I.C.A. committees and Conservation and Extension Officers was maintained in those areas where staff vacancies did not exist but suffered in certain under-staffed Groups.

Liaison at Group level between Group I.C.A. committees and the Department's Group Officers was not affected to the same degree despite the large additional burden carried by the latter in attempting to fulfill their functions with inadequate help in certain areas.

A complete list of I.C.A.s is given in Appendix III to this report.

D.2. *TRANSPORT*

The transport situation remained completely satisfactory during the year, proving that the current practice of allowing officers to use their private vehicles on official duty is a sound one.

Details of the vehicle position in Southern Rhodesia in so far as the Department is concerned was as follows at 30th September, 1962:

	Regions	*Fed. & S.R. H.Q. Staff*	*Total*
Private cars	173	39	212
C.M.E.D. cars and light trucks .	10	6	16
Outstanding loans	3	—	3

D.3. *GENERAL AGRICULTURE, CROP AND LIVESTOCK INFORMATION*

a. Weather Conditions

The 1961/62 summer was characterized by a mid-season drought of from four to six weeks duration which started in early December after initial good, soaking rains had fallen during the previous month in nearly all areas. Considerable hardship was experienced by farmers in the Marandellas South, Salisbury and Mazoe Groups in Mashonaland because of this drought; those along the line of the Mazoe River suffered particularly severely. A few areas to the north and west of Mashonaland were fortunate in receiving well distributed rains throughout the season.

Hard hit were ranchers in the south and south-western portion of the Marula I.C.A. and in the southern part of the Limpopo I.C.A. where extremely poor rains were recorded—making it necessary to declare those areas drought stricken. Fairly general rains in Matabeleland during the second half of January averted what could have been a drought of major proportions.

Particularly heavy falls were recorded in the Mazoe and Umvukwes Groups in March in consequence of the effects of a cyclone which was responsible for widespread rains at that time in other parts of Mashonaland. Good rains in the Midlands and in the Matabeleland lowveld extended well into April but were too late to affect the growth of crops and, in the case of the latter Region, insufficiently heavy to result in much run-off being experienced.

Hail fell in many areas during heavy storms, causing damage to the apple crop around Melsetter in January and to other crops in different parts of Southern Rhodesia as the season advanced. Its incidence was not above normal.

The 1962 winter was mild in nearly all areas. A few cases of heavy frosts were reported to have occurred in August in Matabeleland and the Midlands and one of exceptional lateness in September over a wide area in Mashonaland.

b. Crop Production

FOOD CROPS

(1) *Maize*

Despite the difficult season, excellent crops were produced in the Karoi, Sinoia, Banket and Umvukwes areas and in favoured parts of Darwendale, Salisbury North-East and Mazoe Groups. Very poor yields were achieved in the northern part of the Glendale I.C.A. and in the Bindura and Shamva I.C.A.s, due to the mid-season drought to which reference has already been made. In the Midlands and Eastern Regions yields were surprisingly good, considering the rainfall distribution over the summer period, but the crop was a virtual failure in Matabeleland except on some parts of the sandveld formation in the higher lying areas where reasonable results were achieved. Maize that was supplementary irrigated in this Region gave exceedingly good returns varying from 30 to 38 bags per acre on heavier soils and 25 to 30 bags per acre on sandveld. The incidence of disease was negligible in all areas.

Improved land preparation, wiser fertilization and close attention to detail—particularly in regard to the use of labour—are factors of production to which farmers will have to pay increasing attention if maize is to remain a profitable crop for them to grow now that the price of this commodity has fallen. Maize producers in outlying areas such as Doma, Karoi and Darwin I.C.A.s in particular have suffered in consequence of the alteration in the price of maize. Their transport costs have reduced their margin of profit to the point where they must rely on other forms of production to a much larger degree than they did in the past.

(2) *Sorghums*

Substantial acreages of sorghums were grown in Matabeleland and in the Midlands, a considerable increase in the scale of production taking place in the Victoria and Umshandige I.C.A.s where some 2,000 acres were established to this crop during the season under review, and 10 to 15 bags per acre were reaped. Good sorghum yields were obtained in Mashonaland where trials conducted this past season indicated an encouraging potential.

This is a crop that does particularly well in areas marginal to maize and which, it is thought, will gradually increase in importance—especially on the heavier soils in the agro-ecological zone three. The ease with which it can be mechanized is a significant point in its favour.

(3) *Groundnuts*

As a result of the extension efforts of this Department and the search by farmers for suitable alternative crops to grow in place of maize, a great deal of interest has been engendered in the potential that exists for groundnut production in this country. Acreages grown during this past season, although not large, were sufficiently substantial to indicate that groundnuts have great promise provided that the correct varieties are grown in the areas to which they are ecologically suited, that a high standard of husbandry is maintained, and that mechanical methods of harvesting, picking and shelling are used when more than about 50 acres are grown by any one producer.

Suitable planters, lifting and picking machinery are now available which, in certain areas, can be hired on a contract basis. The Department has worked closely with agricultural machinery firms in stimulating an interest in groundnut mechanization and will continue to co-operate in this way.

Indications are that a greatly expanded acreage will be grown during the coming season in agro-ecological zones two and three.

(4) *Potatoes*

The summer crop in the Eastern Region was beset by drought in December/early January and by water-logging in late January which resulted in lowered yields except on a few well-drained farms where supplementary irrigation was available. Yields in Mashonaland were good except in Marandellas North Group where the mid-season drought resulted in a total crop failure. In the Midlands particularly around Gwelo, tuber moth constituted a problem but was rapidly brought under control as the summer advanced; summer supplementary irrigation of potatoes has become fairly common in that area.

Good yields were achieved in the case of the early irrigated crop in Matabeleland, the Midlands and Mashonaland.

(5) *Wheat*

Progress being made in winter wheat production continues in consequence of the work being done by the Wheat Breeder in producing new rust-resistant varieties adapted to local conditions, and through the enthusiasm of certain farmers who perceive the potential that exists in this field.

Good crops of between 400 and 500 acres in total were grown along the Umfuli River in the Midlands where the bulk of this Region's production is concentrated. An exceptionally good crop estimated to yield 25 bags per acre was grown on the Municipal Farm outside Bulawayo—indicating what can be done under a high standard of management. In Mashonaland wheat under irrigation was grown mainly in the Glendale I.C.A. where the acreage is expanding. In moisture retaining soils in the Beatrice I.C.A. this crop gave only fair results of between four and eight bags per acre.

(6) *Soya Beans*

Widespread trials and the practical experience of many farmers have indicated that there is a potential for the production of this crop in the better watered parts of the country on deep, well-drained loams or sandy-loams. It is an excellent crop to grow in rotation with maize, cotton and sorghums.

Average yields on farms during this past season were not high unfortunately—varying as they did from three to five bags per acre—but this performance will undoubtedly be improved very markedly as farmers gain more experience and become more familiar with the necessary cultural techniques.

Work done by the Pig Industry Board in heat-treating soya beans to make them suitable as a feed for non-ruminants, represents a great step forward in promoting a more general appreciation of the value of this legume and of its worth as a protein-rich feed.

(7) *Sunflowers*

No increase in production of sunflowers occurred during this past season. The potential however, is good, provided that yields in the vicinity of 20 bags per acre can be obtained—at which level it would be more profitable to grow than maize. Now that a stripper combine is available to handle the giant varieties which yield so much better than the dwarfs, there is every likelihood that an increase in acreage of this crop will occur during the coming season.

(8) *Edible Beans*

Only small acreages were grown, but farmers generally planted too late, and yields were disappointing. There is a good market for this particular product and it is the Department's policy to encourage the production of suitable varieties.

(9) *Deciduous Fruit*

The standard of production and quality of fruit have shown a considerable improvement in the Eastern Districts where more recently established orchards, managed according to recommendations of the Ministry, gave excellent yields.

A steep rise in apple production is expected to take place in the next few years, no less than 8,000 apple trees having been planted this past season. There is every indication also that peach production will develop into a major industry in this particular part of the Eastern Region where trials with varieties from California have shown that the season can be extended by up to two or three weeks.

(10) *Citrus, Grapes and Sub-Tropical Fruit*

There has been an increase in citrus production, although slight in most cases, in the Limpopo Valley area in Matabeleland, the Victoria lowveld, the Mazoe Valley and on farms in various other parts of Mashonaland.

Viticulture has made steady progress in the Salisbury, Marandellas and Umtali North Groups and with further experience, it is possible that producers will supply a large proportion of the local requirements. Small extensions of avocado plantings have taken place in the Eastern Region although marketing is still a problem. The stringless Tyler-Premium mangoes are now being planted out on a commercial scale for the first time in this Region.

(11) *Vegetables*

The production of vegetables as a commercial enterprise is concentrated mainly in the Eastern Districts where it has expanded into a major industry, worth half-a-million pounds annually. Research and trials carried out in that area have made local production there competitive with that being done in countries possessing more lavish research and advisory facilities than are possessed by Southern Rhodesia, and it is now a source of justifiable pride that processed vegetables from the Eastern Districts are exported to the United States, Canada, the United Kingdom and Europe.

Vegetable production increased in the Limpopo Valley area, in the Gwaai and Matetsi I.C.A.s and also on the Umshandige irrigation project. The scale of production however, is small.

CASH CROPS

(1) *Flue-cured Tobacco*

Seed-beds.—Although the standard of seed-bed management varies considerably between areas, a common shortcoming is failure on the part of certain growers (approximately 14 per cent. of the total) to fumigate against eelworm. Aside from this factor, many seed-bed troubles can be traced to poor water management—particularly where growth has been uneven.

Pests and diseases have been kept to a minimum through the use of efficient spraying techniques. Some growers, however, still do not employ any disease control measures in seed-beds.

Land Selection and Preparation.—Though marginal soils are still being used in some areas, growers are becoming increasingly more selective in the use of suitable soils for their crop. More second-year lands are being used in areas where crops produced on these soils have sold well, a trend which, though understandable, is to be deplored.

There is a definite improvement in the standard of ploughing and land preparation of late-ploughed lands, particularly where a subsoiler is being used as an aid to ploughing. The use of fumigants in lands, including virgin, is increasing and in some areas during this last season as much as 60 per cent. of all land planted to tobacco was thus treated.

The layout of lands is being improved as a result of the increasing use that is being made of the Work Study Manual by farmers, and slight reductions in fertilizer applications have been made by them due, no doubt, to an increased awareness of the fertilizer requirements of their soils.

Crop Management.—Ideal planting conditions in early November enabled 75 per cent. to 95 per cent. of the crop to be planted out by the end of that month. Though water and insecticides were not always used at planting, stands were generally in excess of 95 per cent. In some areas, however, cutworm damage was severe.

In areas affected by severe drought the quality of crops planted before November 15th was poor though yields were generally satisfactory. The effect of shallow root systems developed during the heavy rains in early November and of severe attacks by eelworm further aggravated the position, causing growth to be stunted and much early flowering to occur. Additional problems were caused by the rapid growth that subsequently took place as a result of the arrival of heavy rains which broke the drought at the end of January and in early February.

In Northern Mashonaland, where the rainfall was well distributed, normal growth patterns produced leaf of good quality.

Height of topping varied considerably with the climatic conditions prevailing in the various areas. Clean suckering was generally well up to standard except during periods of very heavy rainfall.

Reaping.—The pattern of ripening varied considerably with the climatic conditions prevailing in different areas. In the drought-stricken parts of the country the lower half of the plant ripened slowly though the leaf produced was generally thin and trashy. Rains in late January and February and the effect of eelworm which was then becoming evident, caused a rapid increase in the rate of ripening and much leaf was lost in the land due to inadequate barn accommodation. In other areas ripening was at first normal and then fairly rapid causing the loss of some leaf before it could be reaped.

Curing.—Seasonal effects generally made curing difficult, particularly in the drought-stricken areas where sponge and slate affected the cutters and lower leaf grades. This was aggravated by the effect of eelworm and the overpacking of barns which took place as a result of rapid ripening in the lands.

Storage.—There was an appreciable amount of "bulk-burn" due to the over-conditioning of leaf in bulks constructed during periods of high humidity. This was often made worse by inadequate storage facilities on many farms.

Grading, Baling and Presentation.—Too much emphasis is still being placed on grading to colour and not enough on the separation of leaf types and qualities. Efficiency in grading methods is, however, being much improved by the widespread application of work study techniques to this operation. An improvement in grading facilities and the provision of adequate lighting would increase efficiency still further.

Baling and presentation are generally satisfactory though more emphasis should be placed on grouping.

Pests and Diseases.—The incidence of diseases, including Bushy Top, was negligible and posed no problem. Cutworm and budworm attacks caused widespread damage but were effectively controlled by the use of insecticides. White mould, where it occurred, was effectively controlled by Karathane.

Buildings.—Athough about 2,000 new barns were constructed throughout the country, barn accommodation was still inadequate for the efficient handling of this last season's crop, over 30 per cent. of which, it is estimated, was lost in the land for this reason.

More grading and storage facilities are also required.

(2) *Turkish Tobacco*

The heavy infestation by Bushy Top experienced in 1960/61 resulted in a much smaller acreage of Turkish tobacco being grown during the 1961/62 season and, as the incidence of virus diseases was low, some excellent crops were produced. Crops grown in Matabeleland were encouragingly good, and a sound foundation has been laid for future expansion in that area.

The main change in production techniques that has taken place is the almost universal use now being made of some permanent buildings for curing. Various systems have been used to slide the tobacco under cover during wet periods and at night and the consequent elimination of the use of polythene that this has brought about has reduced costs of production. The more efficient use of labour must now be investigated if production costs are to be further reduced.

The 1961/62 crop sold well and consequently there is renewed interest in growing Turkish tobacco in both the high and low rainfall areas.

(3) *Burley Tobacco*

South-Western Area.—The trial acreages planted throughout the country this past season were successful and an average yield of 1,185 lb. per acre was sold for just over 31d. per lb., giving a gross return of £154 per acre. Much information was obtained from these trials on both the cultural and curing aspects which will prove useful for the crop next season.

The quality of the tobacco produced generally proved acceptable to the trade and there is now a rapidly increasing interest in this crop to the extent that over 400 growers will produce it in 1962/63.

North-Western Areas.—This season a crop of 1,628,564 lb. was produced from an estimated 2,060 acres giving an estimated yield of 790 lb. per acre which sold for an average of 32.12d. per lb. This is an increase of 5d. per lb. over the previous year.

Early rains enabled over 50 per cent. of the crop to be planted by December 25th and stands were over 95 per cent. in some cases. However, lack of sunshine slowed down initial growth. Though many of the primings and lugs were discarded due to humid conditions, many of the later reapings were heavy textured and dark in colour producing red and heavy red pipe Burley of good quality.

Excellent prices were paid for the Burley that was grown and it is anticipated that 3,500 acres will be established to this crop on European farms in the North-Eastern area next year.

(4) *Cigar Tobacco*

Though the cigar wrapper crop grown at Melsetter this year was badly infected with spot diseases, that grown on the Copperbelt was free of disease and leaf of fair quality was produced.

The Tobacco Research Board trial will be continued on the Copperbelt next season.

(5) *Cotton*

During this last season cotton was grown mainly in the Glendale, Bindura, Shamva, Angwa North and Doma I.C.A.s in Mashonaland and in the Umfuli and Victoria Groups in the Midlands. Yields varied from 1,800 to 2,000 lb. of seed-cotton per acre in Mashonaland in those cases where reasonable spraying programmes were carried out; on one farm where supplementary irrigation was given, 3,000 lb. per acre were harvested. An almost identical figure was achieved on a farm under dryland conditions in the Umsweswe I.C.A.

In direct consequence of the great strides that have been made in controlling insect pests in cotton, wide interest has been engendered in this crop which will be planted on a large scale in certain areas during the coming season.

(6) *Horticultural and Crop Seeds*

Seed maize was the most widely grown seed crop in Mashonaland during the year and played quite an important role in the Midlands as well. A marked increase in the production of lettuce seed was noted in the Umfuli Group and good results were achieved with cauliflowers, peas and beans under irrigation grown for seed purposes in various parts of Mashonaland.

There is a lack of interest in this type of production in the Eastern and Matabeleland Regions due to the far better economic returns that are obtained there from fresh vegetables which, in the case of the former area, are grown mainly for canning or dehydration purposes.

(7) *Sugar-cane*

No less than 24,000 acres have been established to cane under irrigation in the Victoria lowveld and at Chirundu in the Zambezi Valley—a figure which represents 40 per cent. of the total acreage under irrigation in European areas.

It is anticipated that there will not be any further significant expansion in this field in the immediate future.

(8) *Tea*

Approximately 600 additional acres have been established to this crop during the year, making a total of about 6,000 acres which yield just on 2,000,000 pounds of dry tea per annum.

Farmers at Chipinga are being encouraged by one company to plant and pluck tea on their own farms for delivery to that company's central factory.

Irrigation of tea is undoubtedly improving yields, but there will be no major development in this direction until the economics of the practice have been determined.

(9) *Coffee*

The acreage down to coffee in the Eastern Region is now 417, which figure the Rhodesia Coffee Growers' Association is keen to expand to 1,975 acres as soon as possible.

Government has shown its confidence in the potential that exists for this crop by approving the post of Coffee Officer who, when appointed, should go far towards ensuring that this new industry is allowed to develop along correct lines.

(10) *Fodder Crops*

Lucerne remains the most important fodder crop produced under irrigation and in the Eastern Region acreages down to this perennial legume continue to expand slowly. Reliable inoculants made available by Grasslands Research Station will undoubtedly encourage production.

In consequence of the fall in the price of maize, maize crops are being used to an increasing degree in conjunction with urea as protein supplementary feed and, on their own account or mixed with a legume such as Velvet beans, as silage. Jackbean for both grazing and silage is increasing in popularity and in frost-free areas in Mashonaland Dhal is being more widely grown than before by farmers who are beginning to appreciate its value as a high protein winter feed.

Generally it may be said that farmers are becoming more appreciative of the need for better integration of arable and livestock production. Nevertheless, much remains to be achieved and, because of this, a great deal of extension effort will be directed by this Department towards strengthening the sense of awareness among farmers of the indispensable role that fodder crops play in any enterprise where livestock are run for profit.

c. LIVESTOCK

BEEF CATTLE

The season was rather unfavourable for cattle, particularly in the drier parts of the country where prolonged dry spells in the summer had an adverse effect on summer weight gains. There was also a shortage of water in parts of the lowveld, and restrictions on the movement of cattle due to foot-and-mouth disease further hindered management in some of these areas.

Feeding

Due to the reduced price of maize an increased number of cattle were fattened in pens. Generally the standard of feeding was high and the results reasonably satisfactory, although some inconvenience was caused by the compulsory spread of slaughter bookings. It is anticipated that the new cattle price schedule will induce a more even flow of cattle to take place from farms to the Cold Storage Commission works.

There was a very keen demand for feeder bullocks and weaners, and prices for these classes of stock were higher than in recent years. Summer-fattening of steers on the grass was practised to a small extent in Mashonaland and parts of the Midlands, and this practice is likely to increase steadily in the near future.

There was a continued and steady increase in the amount of winter supplementary feeding in all Regions, particularly in the use of proprietary formulations mixed with home-grown maize. Nevertheless, there is still a large proportion of the national herd which receives little or no supplementary feed in winter.

Management

The general standard of management continued to improve and in Matabeleland particularly, a great deal of emphasis has been placed on the importance of light stocking rates in summer to obtain maximum weight gains during the short growing season. The results of this policy have been very satisfactory.

Breeding

As a result of the keen demand for crossbred bullocks, a very large proportion of breeders are changing from a policy of pure breeding to one of cross breeding, using bulls of exotic beef breeds. Unfortunately it appears that cross breeding policies are in many instances unsystematic, while in other cases the producer fails to realize the importance of improved management and feeding in producing the desired standard and type of feeder steer.

There has been a tendency towards greater specialization in production, it being particularly noticeable that more producers are specializing in the production of weaners and yearling stock for sale. It is also obvious that those maize farmers who have sufficient summer grazing are able to grow these yearlings out more rapidly and economically than breeders in ranching areas.

DAIRY CATTLE

Due to the continually declining net realization obtained from fresh milk production, there has been an overall increase in production and efficiency and particular emphasis is now being paid to the production of home-grown feeds.

Little change has taken place in the number of producers supplying whole milk. However, transport is proving to be a critical factor in the cost of production, and while high transport costs are curtailing production in many outlying areas, several of the larger producers, particularly those nearer the consuming centres, have increased the output from their herds.

SHEEP

There was very little, if any, increase in sheep production. The main reason for this was the fact that most flocks are small and are not given a great deal of attention. Under these circumstances, and particularly in the higher rainfall portions of the country, internal parasites are a major problem.

Many producers have been disappointed with the poor returns received for low-quality carcasses which are being produced at present. One of the basic causes of poor carcasses is the poor mutton conformation of many of the sheep to be found on farms at present. It is encouraging that increased numbers of better quality rams are now being used, the Dorper predominating.

An increased interest in sheep production is being shown in Matabeleland, where, as is the case in the Midlands, a large potential for increased production is known to exist. There are already a number of farmers in these two regions who are producing quite successfully on a reasonable scale under semi-intensive systems.

PIGS

Smaller-scale producers are going out of production in consequence of the drop in prices that has resulted from an over-supply of porkers and baconers. Nevertheless, there is a tendency for large-scale producers to operate at the same level as before, or even to increase production in some cases. Furthermore, in an effort to economize, producers are feeding large amounts of maize to pigs which is resulting in a high proportion of undesirable carcasses. This is aggravating the position further.

FISH

There was little development in this field. Production at present is mainly for farm labour from farm dams, with only a few commercial sales.

LIVESTOCK IMPROVEMENT SCHEME

This scheme continued in operation.

In order to facilitate more accurate selection and culling of beef breeding stock on the basis of fertility, milk production and growth, particularly in those herds used for breeding bulls for sale, a Beef Recording Scheme has been developed which will come into operation early in the coming year. This scheme should also provide data which will be useful in improving the standard of management of beef cattle in commercial herds.

Details relating to the importation of stock and stock purchased by the Livestock Improvement Committee for farmers, are given in Appendix IV.

d. Irrigation Development

General Progress

See also Paragraph C.5. Development was satisfactory and crop acreages under irrigation increased except in the case of supplementary irrigated tobacco and maize.

Visits and Courses

During the year 189 irrigation advisory visits were made to farmers by Irrigation Officers in addition to the numerous visits carried out by other officials of the Department. These visits covered all aspects of irrigation, from layout of lands to overhead irrigation. Although no short courses were held for farmers, good use was made of I.C.A. committee meetings to discuss various aspects of irrigation farming. As a result of the large number of courses on this broad general subject that were held several years ago, the need today is for short discussion groups on specific matters relating to irrigation.

Water Supplies

The past season was not a good one as regards water supplies for irrigation, as many dams failed to fill.

Major Schemes

Triangle.—All cane plantings are complete giving a total of 15,000 acres under this crop on the estate, plus the area planted by the settlers. Yields were good under both sprinkler and flood methods.

Hippo Valley.—The Estate and settlers finished planting cane, and yields were also very satisfactory. The new sugar-mill was opened this year.

Umshandige.—Shortage of water has seriously affected this scheme in that basic allocations have had to be reduced. It is obvious that unless the water level in the dam rises considerably, much hardship will be experienced by the farmers concerned. Barley is the main winter crop and the results this year were reasonably satisfactory.

Umgusa.—Lucerne is the principal crop that is grown, being used mainly as a feed for dairy animals; a smaller acreage of vegetables is grown for the Bulawayo market. Most of the farmers use overhead irrigation which, in these comparatively sandy soils, appears to be the best method of water application.

Crops Under Irrigation

Fodder Crops.—Lucerne and fodder crops account for most of the acreage irrigated by farmers. Oats and barley are becoming increasingly popular with the dairy farmer and, with lucerne, are giving very good results.

Sugar-cane.—This is by far the most important crop with almost 24,000 acres planted, and accounts for 40 per cent. of the total area under irrigation by Europeans.

Cotton.—It is still felt that in the warmer areas of Southern Rhodesia, cotton under supplementary irrigation is the best crop to grow. More information is required about the economics of cotton production on a field scale, and this next season's results will supply much of the necessary data.

Wheat and Barley.—Great interest has been aroused in these crops, and if the anticipated high yields are realized there should be expansion in the future.

Vegetables.—Very good progress was made in the field of vegetable production—particularly in the Eastern Districts.

D.4. *SOIL CONSERVATION*

a. ARABLE AREAS

The yardage of contour ridges, storm drains, grass strips, drainage lines and pasture furrows that were pegged is substantially the same as that achieved in 1960/61. Details concerning these are given in Appendix V of this report.

The construction and maintenance of contour banks still leave much room for improvement. Invariably, investigations of complaints against improperly pegged layouts reveal that pegging was perfectly satisfactory and that the fault lay with poor construction and maintenance. The incidence of contour bank failure has fortunately been small, due to the fact that there have been very few heavy storms in the past few years and protective works have not been severely tested.

A committee, made up of members of the Planning, Engineering and Work Study Sections of the Department, has been set up to study improvements that can be made to land layouts.

b. AFRICAN CULTIVATION

A higher standard of arable land-use and better protection against erosion is being achieved in those areas on European farms that are cultivated by Africans. This improvement and the better crops that are being produced by these cultivators are in large measure due to the guidance and advice given by Conservation Assistants.

c. ROADS AND RAILWAYS

Cordial relations exist between the Department and the road and rail authorities, particularly regarding matters that relate to stormwater disposal and drainage. Conservation Officers are sometimes asked to advise on road alignment and quarry protection—especially by road councils. In addition, a considerable amount of re-alignment of farm roads is done.

d. VELD MANAGEMENT

The level of veld management though it is improving slowly, is still very far below the required standard. Many farmers are apparently aware of the principles involved, but few apply these in practice. Attempts will be made during the coming year to persuade one or two farmers in each I.C.A. or Group to carry out proper veld management, and to demonstrate the correct methods to other farmers through the medium of farmers' days.

In Matabeleland, good progress was made during the year in convincing farmers of the importance of light stocking during the first three months of the growing season, to ensure both maximum summer weight gains and the best possible balance between bush and grass. However, localized overstocking is still taking place which can invariably be traced to inadequate and poorly distributed watering points.

e. VELD FIRES

The incidence of veld fires was high during the long, dry season. Many fires were started deliberately but most were of accidental origin.

Though fire rangers are serving a useful purpose in many areas, the only real solution to the problem is better veld utilization and the construction of fire breaks along boundary and internal fencing lines on farms. Some I.C.A. committees have been successful in implementing a fire control plan and it is hoped that this good example will spread to other areas.

f. BUSH ENCROACHMENT

As a result of continuous emphasis on the part of the Department there is now a very definite awareness of this problem amongst farmers.

A number of eradication methods are being tried in different parts of the country. These include manual control, burning, chemical control and ringbarking or chopping out a proportion of the trees and then resting the area in preparation for a burn.

It is difficult to see much progress being made in those areas where the cost of clearing is greater than the land's market value. The essential need is to lower bush eradication costs and to avoid the use of practices which stimulate encroachment.

g. FENCING

As a result of farm planning, many fences are being moved and further subdivision of grazing areas is taking place. Progress however, has been limited, due mainly to the lack of finance.

h. CATCHMENT SCHEMES

Gully erosion control works were carried out in the Bembezi-Inkwekwesi and Inyankuni catchments as well as in the Glendale, Bindura and Arcturus I.C.A.s. Sheet erosion measures were established in the Bindura I.C.A. and spillway erosion control works were constructed in the Glendale and Karoi I.C.A.s. Gully control and soil emelioration trials in the mopani soils of the Bembezaan I.C.A. continued during the year (See C.2. (d) Advisory Experiments (Regional)).

In all, a total of approximately £10,000 was spent on projects under section 23 of the Natural Resources Act. There is, however, a great deal of work outstanding, especially in the Bembezi catchment.

D.5. *WATER CONSERVATION*

a. DAM CONSTRUCTION

The number of dams constructed during the year fell considerably, 275 being built as compared with 672 in the previous year. The drop in number can be attributed mainly to the fact that—

(i) farmers are reluctant to make large capital improvements at present, due to the uncertain political situation;

(ii) the new procedure adopted for allocating subsidies (advance approvals) has, for various reasons, led to a decline both of applications for investigation of dams and for their construction;

(iii) dam construction is seldom a major priority when the preceding rainy season has been good;

(iv) there is a genuine lack of capital for dam construction.

It is interesting to note, however, that the trend towards building dams with bigger capacities is continuing in the higher rainfall areas.

Details regarding the number and aggregate capacity of the dams that were built and the agencies responsible for this construction are given in Appendix VI.

b. MECHANICAL UNITS

Government Units

In spite of the fact that the demand for dams was poor during the year, Government units were kept fairly busy on various projects such as bush clearing for various Government departments.

I.C.A. Units

The last I.C.A. unit stopped operating during the year, after building four dams. This marks the end of a very important period in the history of water conservation in Southern Rhodesia.

The committees who have over the years operated these units so successfully have contributed magnificently to the water conservation programme of the country.

D.6. *FIELD TRIALS*

Of the 122 field experiments established and/or supervised by field staff in Southern Rhodesia during the year, 35 were critical cropping trials, properly replicated and capable of statistical analysis. Twelve of these were carried out at the request of the Department of Research and Specialist Services, and concerned either maize or sorghum varieties. Six trials on various aspects of flue-cured tobacco production were done in collaboration with and at the request of the Tobacco Research Board.

The standard of this field experimentation has steadily improved but the overall programme is being markedly handicapped by the lack of an officer trained in biometry and statistical techniques. The need for such an appointment is becoming increasingly clear—not only from the point of view of supplying designs, but also from that of producing analyses and critically correct interpretations of results. Such an officer, were he to be appointed, would also be made responsible for the cropping aspects of the Department's vlei drainage trials, of which there are now over 30 in various parts of the country.

A complete list of the Department's field trials carried out in 1961/62 is given in Appendix VII.

D.7. *ADVISORY SERVICES*

a. Visits to Farms

There was an overall increase in the number of field visits that were made by officers to farms. This achievement is significant in view of the many staffing problems which beset the Department during the year.

A complete schedule of these visits, analysed into the various categories, is given in Appendix VIII.

b. Farmers' Days, Courses and Discussion Groups

Almost a thousand farmers' gatherings at which various aspects of agriculture were demonstrated and/or discussed, were organized by the Department in conjunction with I.C.A. and Group committees. These field days and discussion groups as well as the courses that were organized for farmers by individual Regions, are regarded as extremely effective extension media in that they allow the extension worker to achieve a comparatively wide coverage at little cost; moreover the advantage of close personal contact is not lost although it is, of course, not as strong as that engendered by individual farm visits.

c. Agricultural Shows

Departmental exhibits were on display at each agricultural show, the theme being "alternative crops to maize". A great deal of work went into these displays which were effectively simple in most cases and not overburdened with detail.

The standard of agricultural shows generally continues to rise and those that were held this year were distinguished not only by the wideness of their scope, but also by the standard of their exhibits in the livestock field. The quality of the animals on display was good in all sections, but particularly in the fat-stock category, which was well represented at most of the shows—even in smaller centres where, indeed, the number of beef entries was encouragingly high.

d. Conservation Education

Excellent progress was made in Matabeleland in inculcating in teachers an awareness of the importance of resource conservation and in stimulating them to want to know more about this subject. The activities of the Conservation Education Action Committee, on which is represented the Natural Resources Board, Federal Ministry of Education and the Department of Conservation and Extension, were undoubtedly responsible for this encouraging development. In other Regions progress in this field was also good, although less spectacular than in Matabeleland.

Many field visits and several courses on conservation matters were held for teachers during the year. These were well attended in the main—the teachers realizing their value as a source of background information for inclusion in the normal subjects for which they are responsible.

Conservation Week, the theme of which was "Trees and Shrubs", was enthusiastically supported by virtually all schools.

D.8. *EXPERIMENTAL FARMS*

a. Chipinga

Well conducted trials on coffee dealing with various agronomic aspects of production, aroused favourable comments by various authorities and planters from East Africa. They are to be revised as from next season and will embrace a 20-acre demonstration unit which will include shade and shelter trees.

In addition to the coffee experiment, eight other cropping trials were carried out on the Experiment Farm during the year—including a maize variety trial and a radish seed trial done at the request of the Department of Research and Specialist Services.

Following the American practice of growing maize in Bermuda grass (Cynodon dactylon), over 20 bags per acre of this crop were reaped from a Star grass

(Cynodon plectostachyum) pasture where maize had been planted after one ploughing and discing in October. Only one cultivation was given after planting. In addition to the grain crop, the Star grass was two feet high at the end of the rains and, with the maize stalks, provided excellent autumn/winter foggage.

Regular rations of fresh fish were given to the African labour force of 14 from the one-acre pond in which Tilapia are established.

Friesland steers are now being raised for beef, replacing the pig section which was sold on the recommendation of the Advisory Committee made up of local farmers and officials of the Department. This committee, it should be mentioned, has developed into a most useful body with a wide appreciation of national as well as district needs.

All milk from the 40 cows in the Friesland herd is sent to the local Co-operative Cheese Factory—a practice which is now being followed throughout the Chipinga I.C.A. This dairy herd, developed from culled cows obtained from Grasslands Research Station, Gwebi Agricultural College and elsewhere, achieved this year for the first time a herd average higher than that of either of these two other stations.

b. Karoi

During the year the second meeting of the Advisory Committee was held at which certain proposed alterations to the 1962/63 programme were discussed. As in the case of Chipinga, much reliance is placed on the good judgment of this committee which plays an important role in helping to ensure that the Experimental Farm's programme is geared to meet the most pressing needs of the area.

Climatic conditions during the 1961/62 season were generally favourable for crop production, good yields of groundnuts and maize being obtained. Soya beans were rather disappointing in that only 4.5 bags of seed per acre were reaped. Forty-six acres were established to Dhal during the year, of which the earlier plantings did very well; unfortunately, due to arson, 35 acres of this crop were destroyed by fire. Half an acre of Burley tobacco yielded well, 739 lb. of leaf being sold at an average price of 34.17 pence per lb. Lack of humidity control during curing and grading constituted a problem. Sunflowers and velvet beans were other crops that were grown as well as potatoes and lettuce under irrigation.

Various beef cattle feeding trials were conducted using different methods of supplementation during summer and winter. No firm conclusions can be drawn from these experiments during the first year of their operation. A 70 per cent. calving rate was recorded in the case of the breeding herd of 50 cows; this herd has since been reduced to 30 to make room for a larger number of steers for fattening and finishing.

A sheep trial in which half the flock received protein supplements during the winter and the other half no supplements of any kind, resulted in a high mortality rate in the unfed group. Strict culling of the sheep flock has been undertaken.

Four critical variety cropping trials with maize, soya beans, groundnuts and sunflowers were successfully carried out. These were very well managed and supervised.

E. NORTHERN RHODESIA

E.1. *ORGANIZATION AND STAFF*

No fundamental changes were made in the general organization and administration during the year ending 30th September, 1962. There were, however, problems which while not currently affecting the efficiency of the Department to any serious degree, nevertheless offered potentially adverse influences on efficiency and general morale.

In this respect lack of suitable housing in some intensive conservation areas was undoubtedly a source of dissatisfaction for both European and African staff, but during the past six months active steps have been taken to rectify the position and there should be considerable improvements in all areas in the near future.

Despite numerous transfers within the Department and the inevitable disruption which this occasioned, for most of the year the professional staff position in Northern Rhodesia was satisfactory except in the Monze-Pemba, West Chisamba and Mwomboshi I.C.A.s. It was found necessary, in the interests of more economic utilization of staff, to reorganize the Zambezi Group under one Group Officer.

Relationships between officers of the Department and I.C.A. and Group committees have been extremely good.

E.2. *TRANSPORT*

The existing transport arrangements whereby officers are allowed to use their own vehicles on official duty continued to be satisfactory.

E.3. *GENERAL AGRICULTURAL, CROP AND LIVESTOCK INFORMATION*

a. CLIMATE

Light rains and overcast conditions occurred in early November throughout the country. This developed into steady rain and continued to the end of November.

After these initial rains during which the major portion of the tobacco and maize crops were planted, a dry hot spell followed which was more severe in the southern portion of the Territory, lasting from two to four weeks. North of Lusaka it was of shorter duration. These dry spells in early and mid-December were followed by general rains. Wet conditions continued in the northern section, while further south a period of drought followed.

From the middle of January conditions improved in the south, but this period was followed by a dry spell of two to three weeks duration in early March, and then widespread heavy rains occurred, especially in the north. The rainy season came to an end towards the middle of April, with some heavy isolated storms taking place at that time. Precipitation figures for the year indicate above normal rainfall of between 55 and 65 inches on the Copperbelt and Mkushi, diminishing to 31 inches in Lusaka and between 25 and 30 inches in Kalomo and Choma.

b. CROP PRODUCTION

FOOD CROPS

(1) *Maize*

The 1961/62 season was an excellent one for maize production and about 1,400,000 bags were reaped. There is still, however, a wide variation in the yield per acre achieved in different areas.

The future objective is to aim for higher yields with reduced costs of production, and emphasis will be given to this aspect and the following ones, by officers of the Department:

- (i) Basic principles of good land preparation, weeding, fertilizing, plant populations and the incorporation of large quantities of organic matter.
- (ii) Timeliness of operations.
- (iii) Importance of liming where necessary. A survey of this aspect has indicated that a high percentage of soils need liming.
- (iv) The application of pesticides to control corn root worm. The pest was widespread during this past season, depleting many stands.
- (v) The more widespread use of hybrid seed. The latest agricultural statistics show that in Mazabuka, Lusaka and Chisamba between 30 per cent. and 60 per cent. of the growers are still using open-pollinated varieties.
- (vi) Land Selection. Too many farmers are still using lands with a "wetness" factor when better drained lands are available.

(2) *Sorghums*

During the last few years there has been a steady increase in sorghum production, mainly in Mazabuka. Yields of up to 15 bags per acre were recorded during the season under review, using Framida and South African hybrid varieties. The latter however, do not qualify for the "S" grade.

Growers had to contend with bird damage, attacks by stem-borer and aphids as well as fungal disease infection.

(3) *Groundnuts*

Groundnuts grow well in Northern Rhodesia and production is increasing rapidly. Yields of between six and 10 bags per acre were obtained during the past season. Farmers are now more familiar with mechanical planting, stripping and shelling of this crop and individual acreages will be increased.

Varieties such as Makulu Red and Valencia are the most favoured. During the coming year the Department will continue with field trials and will assist inexperienced growers in the techniques of groundnut production.

(4) *Potatoes*

Yields of potatoes were below average due to a shortage of seed. A total of 676 acres of potato plantings spread over three cropping periods yielded 57,500 bags—an average yield of 85 bags per acre.

(5) *Wheat*

Improved methods of irrigating wheat have been demonstrated on a field scale and new wheat varieties are now being grown. The 1962 crop gave good yields and this particular cereal can be expected to play an even more important role during the 1963 dry season in the economy of farms with cheap natural water supplies than it has done up to now.

The Department will do everything it can to encourage wheat production where conditions are favourable.

(6) *Vegetables*

The area being used for vegetable production has increased to over a thousand acres and the local demand is now almost satisfied. Management, continuity of supply and good presentation have improved, but these factors will again be stressed.

(7) *Citrus and Sub-Tropical Fruit*

(i) *Citrus.*—One thousand acres of citrus have now been planted. Better management—especially in watering—resulted in increased yields per tree. Farmers should soon be able to supply all local requirements.

(ii) *Bananas.*—Expansion of banana production continued and 150 acres are now down to this crop, mainly around Lusaka. A severe frost during the year was responsible for delaying local production, but it is still anticipated that Northern Rhodesia will be self-sufficient in the near future.

(iii) *Other Sub-tropical Fruits.*—The production of mangoes, avocadoes and guavas is sufficient for local consumption, the main source of supply being from home gardens.

CASH CROPS

(1) *Flue-cured Tobacco*

Seed-beds.—Seed-beds are still not being sown early enough to enable seedlings to be hardened adequately, though early rains gave ideal planting conditions during the 1961/62 season. Poor water management caused uneven growth.

Anthracnose was severe in Mkushi but was controlled by spraying, as were isolated attacks by cutworm.

Land Preparation.—The standard of late ploughing is improving and there is now more fumigation of reverted lands; a small acreage of second-year land was used in the Southern Province during the 1961/62 season.

Crop Management.—Due to excellent planting conditions, up to 90 per cent. of the crop in the South-Western area was planted by 20th November and the exceptionally high proportion of 50 per cent. in the Eastern Province. Ninety-five per cent. to 98 per cent. stands were obtained even where the crop was planted with the rain. In the Southern Province, growth was stunted due to dry conditions.

Topping was generally higher than in the 1960/61 season and suckering was adequate.

Reaping.—In the Southern Province, primings and sandlugs were thin and trashy due to the drought, but other leaf was of good quality. False ripening occurred in the higher rainfall areas and leaf was lost in the land due to inadequate barn accommodation.

Curing.—Leaf quality was affected by barn rot, sponge and barn spot, which made curing difficult. This was aggravated by inadequate barn accommodation.

Bulking.—Storage space is still a limiting factor on many farms and this affected the standard of rough baling and bulking. In the Eastern Province all tobacco was loose-baled, and some of it was over-conditioned and funked.

Grading, Baling and Presentation.—The standard of farm grading was good, though a large proportion of the crop was commercially graded. Baling and presentation were satisfactory.

Pests and Diseases.—The top few leaves of later planted crops were infected by alternaaria, frogeye and angular leaf spot disease, which affected reaping and curing. Budworm and cutworm damage was severe in all areas. The incidence of Bushytop was slight.

Buildings.—Though many extra barns were built and more storage space was provided, barn accommodation was generally inadequate for the efficient handling of the crop.

(2) *Turkish Tobacco*

The growth of the crop was good, though insect pests were a problem. Reaping and curing were severely affected by late rains though good quality leaf was produced which sold well.

(3) *Burley Tobacco*

In the Eastern Province, where the major portion of this type of tobacco is produced in Northern Rhodesia, seed-beds were poor due to bad management and inadequate supervision.

Early rains enabled 50 per cent. of the crop to be planted by the end of December. Humid conditions caused the loss of many primings and lugs, though good quality, dark heavy red leaf was produced from the remainder of the plants.

A trial crop was planted in the South-Western area which sold well. Growth was good, though curing was affected by humid conditions, particularly where buildings were inadequate.

(4) *Cotton*

Production of cotton has been negligible. Greater interest is now being taken of this crop due to new techniques of pest control which have increased yields to an economic level. It is expected that over 500 acres will be grown in the 1962/63 season. The Department will continue with trials and will give emphasis and guidance on this crop in areas where it can fit into the farming system. Specific attention will be given to the control of pests.

(5) *Seed Production*

Seed production has dwindled down to four registered potato seed producers, a few pasture seed growers, four hybrid maize seed growers, two tobacco seed growers and two vegetable and flower seed producers.

Farmers will not become interested in horticultural seed crop production unless it can be demonstrated that economic returns can be obtained from this type of enterprise.

FODDER CROPS

(1) *Lucerne*

Lucerne production has increased, not only because of larger acreages down to this crop, but because of higher yields obtained through the use of improved layouts which have led to better management. The Department is encouraging lucerne production where irrigation is available, in order to reduce the amount of concentrates that has to be purchased for livestock feeding. It has been demonstrated on the Chalimbana Experiment Farm that this approach is an eminently sensible one.

(2) *Dhal*

Although a severe frost affected the Dhal this winter (for the first time since 1956), farmers are increasing their acreages. The crop is not only useful for providing fodder, but fits well into a maize rotation.

(3) *Jackbean*

It has been demonstrated that Jackbean silage is easy to make and is a very useful high-level protein feed.

(4) *Soya Beans*

This crop is being grown mostly for fodder production. Yields of grain have been variable, from two to six bags per acre. Further experimental work will be carried out on this crop and the Department will emphasize the importance of factors such as the need for adequate inoculation, the use of the correct variety, seeding rate and depth of planting, weeding and correct time of harvesting.

c. LIVESTOCK PRODUCTION

The year has been favourable for all forms of livestock production, the weather conditions which prevailed resulting in good veld grazing and good fodder crops. Prompt diagnosis of and wide-scale vaccination against lumpy skin disease by the Veterinary Department during March and April rapidly brought this disease under control.

The heavy rains in February, particularly in the clay soil areas, resulted in very muddy conditions which favoured the onset of Senkobo disease.

(1) *Beef Cattle*

Beef production expanded and a further improvement in the nutrition and management of the herds took place.

During the year the Beef Infertility Survey organized by the Agricultural Research Council was completed but the results are not yet available. It is quite clear that many farmers do not have accurate information on the performance of their cattle when measured in terms of reproduction. The newly inaugurated Beef Recording Scheme should help to focus attention on this need for basic factual information.

An increased number of cattle have been fattened during the winter of 1962. There has been a marked swing away from the use of purchased protein concentrates and a far greater reliance placed upon the use of home-grown protein supplies, such as Dhal, the acreage of which has increased appreciably. The amount of legume silage made also increased during the year, the advent of cheap, simple flail type foggage harvesters stimulating this kind of fodder production. Excellent results have been obtained from the use of legume silage and maize meal for fattening steers.

The use of urea/salt blocks as a simple form of winter supplementation continues, with a swing to a more complete type of supplement based upon salt, urea, maize meal and vegetable protein.

Feeder bullocks are being neglected between February and July in their final year. This results in poor gain from February to the end of the rains and losses from then until the feeding period commences. This negative approach prior to the feeding period will probably be overcome by the proposed price incentive to be paid for heavier cattle, coupled with the lower prices offered during the early winter period. A simple form of protein supplementation, towards the end of summer, rather than at the beginning of winter, should overcome this present weakness, particularly if it is combined with the best possible grazing.

On the 1st August, 1962, cattle sales on a liveweight and grade basis were withdrawn by agreement with the producers, and all cattle are now graded on the hook.

Cattle fattening has created a marked interest in exotic rather than indigenous type feeder cattle, and has resulted in the increased use of Hereford bulls.

Farmers in Northern Rhodesia were fortunate in being able to deliver all the cattle they had on offer in the September-December, 1961 period to the Cold Storage Commission works. As considerable quantities of beef were imported, there was no need to restrict slaughter bookings during this period. It is still necessary to spread deliveries throughout the year.

The Cold Storage Commission has materially assisted the beef industry by providing farmers with grazers and feeders. The policy of setting up a revolving fund for purchases has assured farmers of continued assistance.

(2) *Dairy Cattle*

During the year the number of registered milk producers fell to 153.

Important changes have occurred in dairy production. Farmers have accepted the need to be self-sufficient and have taken measures to ensure that as much of their feed requirements as possible are produced on the farm and not bought. More legume silage has been made which has increased the amount of fodder available and improved the quality of roughages fed to dairy animals. Greater emphasis has been placed upon the energy content of rations, and the increased levels of energy feeding are expected to improve the solids-not-fat content of the milk produced.

Farmers are now paying far more attention to the culling of low-producing cows, and the selection of heifer replacements. A "Management Check List" was introduced during the year to a few selected farmers with the object of simplifying dairy recording.

(3) *Sheep*

The slow increase in the sheep population continues. This slow expansion of a profitable line of production is in part due to the lack of finance and to the need to develop fully existing lines of production. The biggest weakness in sheep production, however, has been the failure to emphasize the need for adequate handling facilities.

In order to warrant the expenditure of time and effort on supervision, the sheep unit on the average farm should be much larger than a farm flock of 50 ewes.

(4) *Pigs*

The pig population has been maintained during the past year and there are no indications of any expansion taking place.

The quality of pigs being produced is high and producers are paying a great deal of attention to the culling and selection of breeding stock.

(5) *Poultry*

Egg producers had another good year and excellent average prices were obtained. Only a small expansion in egg production took place, although sales of eggs to Africans continues to increase.

Broiler producers have been in a more difficult position with a rather slower market and much stronger competition from Southern Rhodesia. Despite this fact an expansion of broiler production has taken place and the use of an improved type of broiler chick plus increased efficiency has resulted in a lowering of the retail price.

A great deal of advisory work has taken place dealing mainly with housing and culling.

LIVESTOCK IMPROVEMENT SCHEME

The Livestock Improvement Scheme continued to be administered by the Department, some 50 applications being received for grants during the year, of which 41 were approved.

Details regarding importations are given in Appendix IV.

GOOD CATTLE PRODUCTION BOUNTY

This scheme continued to operate during the year, providing financial assistance to cattlemen who wished to effect certain capital improvements. Relevant details regarding what was achieved are given below:—

Number of applications received . . .	251
Number approved	245
Number of cattle applied for	28,826
Number of cattle branded	26,152
Total expenditure	£29,433 5s. 0d.

d. Irrigation

The detailed irrigation survey conducted two years ago revealed that over half the irrigation schemes operating in Northern Rhodesia were not using the available water supply to its maximum capacity and made clear that there were many potentially new areas which could easily be utilized for this type of production. An outcome of this survey was the development of a series of strategically situated field scale irrigation demonstrations, which has been of great assistance as an extension aid. Northern Rhodesia now has a small nucleus of experienced practical irrigation farmers with crops such as lucerne, wheat, bananas, vegetables and citrus all being irrigated in a sound manner. In this regard it is interesting to note that no less than 4,454 acres were under irrigation during the 1961 dry season.

A better understanding of the infiltration rates of various soils achieved through the use of a series of six-inch diameter infiltration rings has helped in laying out flood schemes.

Efforts to encourage farmers to use the corrugation method of irrigation are becoming increasingly successful. Throughout the year overhead spray irrigation schemes were given special attention. Studies were made of precipitation patterns and water distribution efficiencies of rotating type sprinklers.

E.5. *SOIL CONSERVATION*

a. General

The aim of the Department is to eliminate erosion. To achieve this all lands cropped must, if necessary, be protected and the works so constructed, maintained. Stream-bank cultivation, grazing areas and road-water disposal must be given attention relative to their importance in individual I.C.A.s.

Apart from the mechanical protection of lands, emphasis has and will continue to be placed on the importance of vegetation as a protective cover. Grass leys play an important part in tobacco rotations and this aspect will be emphasized by the Department, as it is considered that farmers in Northern Rhodesia do not make sufficient use of these leys.

b. Mechanical Protection of Arable Land

Northern Rhodesia is a relatively flat country and in many areas drainage rather than contouring is a problem. During the last ten years a great deal of protection work has been done, but there are areas such as the Zambezi Group and the Mkushi I.C.A. where mechanical protection is continually required, due to new tobacco lands being opened up.

Statistics showing what has been achieved in the field of mechanical protection of arable land are given in Appendix V to this report. These figures indicate that emphasis on land protection is being given priority in the Zambezi Group and Mkushi. The aim of the Department is to stress continually this need—particularly in these areas and to satisfy all requests for designing land protection measures and carrying these out where necessary.

c. Roads

Main and district roads are generally well drained. Farm roads need realigning and proper drains and great emphasis is placed by the Department on this aspect.

d. Drainage

Good progress has been made in having Regional Plan major drainage works carried out. Chisamba is now complete in this respect and those in the Lusaka area will be implemented soon. South Broken Hill has been re-surveyed and drainage plans have been worked out which will be put into effect early in the new season. These major drains must be supported by farmer-built internal drains.

Ridge and furrow layouts are still necessary on many farms and this aspect is being given priority. Selecting and using better drained soils where these are available constitute a factor that will be continually stressed to farmers.

e. GRAZING AREAS

Grazing areas are not being managed as well as the cattle themselves. Sound veld management is directly related to the stocking rate, the control of fires and bush encroachment and the establishment of fencing and water supplies. Many farmers are aware of these principles but few apply these in practice. The Department is anxious to stimulate progress in this field and will make every effort to persuade farmers, through actual demonstration, to adopt proven veld management techniques.

E.5. *WATER CONSERVATION*

Forty-nine dams holding approximately 700 million gallons were constructed by Government units under Regional Planning and six dams, impounding about seven million gallons, were constructed by farmers during the year. This is a big improvement but there is still a need for more conservation of water, especially in areas such as Mazabuka where stream-flow diminishes rapidly after the rains.

Statistics showing what has been achieved in this sphere are given in Appendix VI.

E.6. *MECHANICAL UNITS*

a. GENERAL

Staff numbers were virtually unchanged from those of the previous year, being made up of 12 Europeans and 62 Africans.

Equipment used consisted of:

10	Caterpillar D.7. Tractors
1	Caterpillar No. 12 Grader
6	Scrapers
7	Rippers (cable-controlled)
3	Bush-clearing Chains
3	Tree-dozing Stingers
1	Low-loader and 6 Lorries

and items of minor equipment and light transport.

Four old scrapers were boarded during the year and were replaced by new, larger units.

b. WORK DONE

A further programme, valued at £44,000, was undertaken for the Sabi Valley Tsetse Clearing Project, being successfully completed in April when the personnel and equipment returned to Northern Rhodesia.

Regional Planning works consisting mainly of dams and drainage schemes, were carried out along the line of rail, and land protection works under African Regional Planning were undertaken in the Ngwesi Reserve. Work on privately-owned farms, consisting mainly of bush-clearing, was also done during the rainy season—a total of 5,510 acres being cleared by the Government units.

The general standard of the work was high and the units have established a sound reputation for reliability and efficiency.

c. WORKSHOPS

Staff shortage during the year strained the resources of the Workshops, a state of affairs which was further complicated by the absence of the Mechanical Engineer on leave. Despite this handicap demands from the field were met adequately.

d. ANALYSIS OF WORKING HOURS

Until the end of March, output of work far exceeded the record figures achieved during the previous year. At that stage, demand for work rapidly declined which resulted in a big decrease compared to the 1960/61 figures. Figures are given at the top of the following page of hours worked and of hours lost for various reasons:

	1961/62	*1960/61*
	hours	*hours*
Normal available hours	29,017	33,480
Overtime worked	6,965	8,480
Total available hours	39,982	41,930
Less servicing hours	2,848	3,411
Net available working hours	33,134	38,512
Hours worked	18,625	22,950
	Per cent.	*Per cent.*
Percentage of available hours worked	56	57·4

Hours Lost:	*1961/62*	*1960/61*	*1961/62*	*1960/61*
	hours	*hours*	*Per cent.*	*Per cent.*
Moving	955	1,923	3·0	5·0
Broken down	5,351	6,454	15·5	16·8
Weather	1,585	1,357	5·0	3·6
Awaiting work	3,106	3,049	9·6	7·9
Transporter	798	839	2·5	2·1
OTHER	2,714	2,746	8·4	7·2
Percentage available hours lost			44·0	
	hours	*hours*		
Output per tractor month	141·1	153·5		

Advantage was taken of the slack period to carry out extensive overhauls of the machines. A portion of the hours shown against "Broken Down" is therefore attributable to "Awaiting Work".

It will be noted that there has been a big increase in hours lost due to "weather" and "awaiting work", and a reduction in "overtime". It will also be seen that the level of efficiency has in fact increased, but that the working hours were heavily reduced through unavoidable causes.

e. FINANCIAL STATEMENT

Profit for the year amounted to £214, after standing at £15,000 at the end of March. Apart from the lack of work during the last quarter, it was also necessary to increase the Bad Debts Reserve by £2,300.

Although the profit made is insignificant, the year must on the whole be regarded as having been reasonably successful.

E.7. *FIELD TRIALS*

A full range of field trials was undertaken on all the Experiment Farms and on several private farms. Flue-cured, Burley and Cigar wrapper tobacco trials were also carried out with the co-operation of the Tobacco Research Board.

Trials on groundnuts were established and pursued to a successful conclusion on the Experimental Farms with the co-operation of the Mt. Makulu Research Station and, despite the very high rainfall of approximately 70 inches that fell on the Copperbelt Experiment Farm during the season, some interesting indications of a potential for high yields of maize were obtained on that station. Trials incorporating the application of lime and trace elements to maize warrant further investigation in that area.

Comprehensive horticultural experiments were done on the Copperbelt Experiment Farm and small demonstrations and trials continued at Chalimbana. Grazing and bush eradication trials on the Copperbelt and Mochipapa Farms have been continued. The trials and demonstrations carried out during the 1961/62 season are listed in Appendix VII.

E.8. *ADVISORY SERVICES*

a. GENERAL

The number of field visits made by officers of the Department has increased by seven per cent. over the total of the previous year—12,247 visits being made during the period covered by this report. Greater emphasis was placed on farm planning, irrigation crops and livestock.

More time was spent on in-service training of officers than previously, as this aspect is considered most important. Reference has been made in this report to specific matters that will be given special attention during the coming year. Management and recording are two of these.

A comprehensive schedule showing the numbers of visits made by officers of the Department during the period covered by this report is given in Appendix VIII.

b. FIELD DAYS AND DISCUSSION GROUPS

There has been a marked decline in the attendance at field days and discussion groups. During the year 143 of these gatherings were held, attended by 2,825 people. This drop in attendance is attributed to the greater use that is being made of the discussion group than of the large field day as an extension technique. At these meetings of farmers and extension personnel, particular attention was placed on alternative crops, while beef, dairying, maize, irrigation and land selection were not overlooked.

c. SHOWS

There has been little change in the show pattern during the past year. Competition in the dairy breeds at Kitwe was weak, but much keener at Ndola. Dairy entries at the Lusaka Royal Show were down, but there was an increase in slaughter stock of good quality. More interest was shown in the agricultural classes generally, the Mazabuka District Exhibit at the Lusaka Royal Show being outstanding in this field.

Africans are beginning to participiate in the major shows, thus adding to the competition, particularly in the agricultural classes. The Department exhibited at all agricultural shows and officers acted as judges and stewards.

d. CONSERVATION EDUCATION

Senior officers of the Department have continued to assist the Natural Resources Board where possible in their conservation education programme. Officers attended and participated in Extension Workshops held in Choma and Lusaka for the Ministry of African Agriculture under the auspices of the Natural Resources Board.

A Careers Day was held for the Copperbelt schools at which members of the Department gave advice to pupils and parents on careers in agriculture. It is hoped that this scheme will be started in other centres. During the coming year all senior schools will be visited by officers of the Department and discussions and outings will be arranged for interested pupils.

e. YOUNG FARMERS' CLUBS

The Young Farmers' Club movement has remained static amongst European schoolchildren, but excellent progress has been reported from African areas. On the Copperbelt and in Lusaka and Mazabuka, officers of the Department have taken part in Young Farmers' Club activities.

During the coming year a further full-time organizer is to be appointed by the Northern Rhodesia Government. It is hoped that this increased assistance will lead to greater club activity.

E.9. *PLANNING*

a. REGIONAL PLANNING

The table in Appendix IX shows the progress that has been made in Regional Planning. Eight plans comprising 558,808 acres were completed during the year, leaving three plans on the line of rail still outstanding. West Chisamba (Lower Wangwa/51) will be completed by the end of 1962 and the two plans in Choma will be completed in 1963.

The pattern of implementation remained constant and all subsidy funds were spent by the end of the financial year. Drainage works and dams received top priority in the schedule of works and a total of 49 dams were constructed under the scheme.

b. FARM PLANNING

The emphasis on planning moved to farm planning (Stage II) in those areas where Stage I was completed. Seven plans in this category were completed during the year.

This particular work has been given high priority in the Department's programme and it is estimated that 45 farm plans will be done during the year. Farmers are now aware of the benefits of farm planning and 88 applications have been received.

c. MISCELLANEOUS PLANNING

No major schemes for resettlement were planned by the Department. The Kafubu Block survey on the Copperbelt was, however, completed and recommendations were put forward. In the Mkushi Settlement Scheme there are now 102 farms surveyed and of these 65 have been alienated.

The Department has continued to carry out numerous investigations for the Agricultural Lands Board regarding the suitability of certain areas for future farming development. Requests by this Board for the assessment of the agricultural potential of farming units have also been dealt with by the Department and this service will continue in the future.

E.10. *FARMERS' DEBT ADJUSTMENT BOARD*

The Planning Section was responsible for co-ordinating the work undertaken for each farmer. The Land and Agricultural Bank of Northern Rhodesia is now responsible for the overall control of the Farmers' Debt Adjustment Board and the Department will assist the Board in an advisory capacity.

E.11. *GOVERNMENT EXPERIMENTAL FARMS*

a. GENERAL

The Experimental Farm Advisory Committees set up in 1961 have functioned reasonably well and have assisted the Department in drawing up the annual programmes of work. The Msekera Experimental Farm was taken over by the Northern Rhodesia Ministry of Agriculture during the year, but experimental work on Burley tobacco, Turkish and other crops will be continued there.

b. MOCHIPAPA

The overall policy under which Mochipapa is now being run remained the same. However, a section of Bygum Acres is now being used to demonstrate a three-herd/four-paddock system of veld management.

Trials carried out were well done and useful information was obtained on flue-cured, Burley and Turkish tobacco, cotton, maize, groundnuts and leguminous fodder crops. Feeding trials on groups of steers comparing Dhal and concentrate feeds were also carried out. The breeding herd supplies weaners for feeding trials and demonstrates good management practices.

The annual field day was well attended as was a field day held especially for African farmers.

Practical, in-service tobacco training courses covering all aspects of production were held on Mochipapa as an integral part of the tobacco in-service training course run by the Department. Instruction was of a high standard.

The programme planned for the 1962-63 season is similar to that which was followed during the year being reviewed, except for the fact that soya beans will be included in the trials. A flock of sheep transferred from Msekera will be used to demonstrate good management practices.

c. CHALIMBANA

Good progress has been made and the aim of demonstrating complete self-sufficiency in the feeding of the dairy herd was achieved through the use of grass leys, irrigated lucerne, legume and maize silage and maize for grain. A high level of production was obtained by efficient feeding and the culling of unsatisfactory dairy cows.

In the beef section the Africander steers that were fed from November, 1961 to February, 1962, graded out well. They were finished off with 5 lb. of maize meal per head per day. The major emphasis in the beef section is to ascertain the effect of different levels of supplementation upon winter and summer gains. The Angoni steers were split into two groups during the winter of 1962. The high-level group is receiving 25 lb. of Jackbean silage and 2 lb. of 10 per cent. urea/corn cob mixture per head per day plus veld grazing. The low-level group is being fed a urea/salt block lick plus veld grazing. These groups will be split again during the summer and will be fed at low- and high-levels of summer feeding.

Cropping trials were carried out on maize, groundnuts and soya beans. These trials will be expanded this year to include Burley tobacco, cotton and sunflowers.

The horticultural section is developing into a good demonstration of the different varieties of sub-tropical fruits that can be grown.

d. COPPERBELT

The main object on the Copperbelt Experimental Farm is to investigate the potential of the area for fodder, cash and horticultural crop production, as only limited information regarding this matter is available for this high rainfall area. Investigations into the carrying capacity of the veld are also being carried out, and a three-herd/four-paddock system of veld management will be demonstrated. The Angoni breeding herd has been increased by the addition of further cows from the Mazabuka Research Station. Feeding trials are also being carried out using weaners from the Mochipapa Farm. The small Friesland herd is being used to test the potential of the fodder crops grown and to demonstrate that self-sufficiency can be a feasible proposition on the Copperbelt.

The trials this year have given good indications of crop potential. Cuttings of good quality lucerne were produced. Although the total rainfall exceeded 65 inches, the single hybrid maize variety 59.H.17 (No. 52), yielded 41.8 bags per acre and double hybrid No. 13, 32 bags per acre. The soya beans using Hernon strains gave yields of up to eight bags per acre. The maize liming trial was inconclusive and will be repeated during the 1962/63 summer. The cotton did not grow out at all well and very few bolls were formed.

The 1962/63 trials will consist of N.P.K., liming and varietal experiments dealing with maize, soya beans and groundnuts. The cigar wrapper trial will be continued and a small amount of Burley tobacco will also be grown. The grazing and livestock trials and the Horticultural Section's rotation trial are to be continued. Specific experiments on different types of vegetables are currently being done.

Coffee and pawpaw trees on the farm were severely damaged by frost and because of this a new site is being investigated.

F. *CONCLUSION*

On my own and my Department's behalf I wish to record my appreciation of the tremendous help that individual I.C.A. committees and the Natural Resources Boards of Northern and Southern Rhodesia have accorded in our work. Without their close co-operation we would have been able to achieve comparatively little.

Similarly the assistance and co-operation we received from the Rhodesia National Farmers' Union and from farmers' associations, the Rhodesia Tobacco Association and associated bodies, has greatly helped us in the performance of our task.

The year was not an easy one for many farmers and it is to their credit that they were able to accomplish what they did despite a very long mid-season drought. We admire the courage that they have shown in the face of adverse conditions.

To my own staff I express my sincere appreciation of everything that they have done to uphold the traditions of our Service.

J. J. DUVENAGE,
Director of Conservation and Extension.

LIST OF COMMITTEES ON WHICH SENIOR OFFICERS SERVED

The Director, the Deputy Director or their representatives served on the following committees dealing with matters concerning the Federation:

Federal Standing Committee on Agricultural Production.
Tobacco Research Board.
Gwebi College Council.
Field Experimentation Committee.
Council of the Rhodesian and Nyasaland Association of Young Farmers' Clubs.
Commodity Committees dealing with groundnuts, soya beans, sunflowers, sorghums and banana production.
Farm Mechanization Standing Committee.
Mashonaland Cattle Council.
Research Advisory Committee.
Seed Stocks Committee.
Hydrological Co-ordinating Committee.
Central African Ploughing Association.

They also served on the following committees concerned with matters pertaining to Southern Rhodesia:

Livestock Improvement Committee.
Natural Resources Board (Advisory).
Water Resources Committee of the Natural Resources Board.
Conservation Education Committee of the Natural Resources Board.
Sub-division of Land Committee of the Natural Resources Board.
Native Affairs Committee of the Natural Resources Board.
Mineral Resources Committee of the Natural Resources Board.
General Purposes Committee of the Natural Resources Board.
Sabi Development Committee.
Sabi Development Farm Committee.
Sabi Catchment Technical Advisory Committee.
Land Settlement Board.
Bothashof School Council (Government representation).

The Department was also represented on the following committees in Southern Rhodesia:

Southern Rhodesian Department of Native Agriculture.
Phillips Committee.
Sabi Catchment Technical Advisory Committee.
Catchment Protection Committee of the Natural Resources Board.
Land Protection Committee.
Y.F.C. National Executive Committee of the Natural Resources Board.
Y.F.C. Regional Executive Committee.
Work Planning Committee of the Tobacco Research Board.
Fertilizer Advisory Committee.
South-Western Tobacco Marketing Board.
Central Africa Turkish Tobacco Association.
Rhodesia Tobacco Seed Association. (Executive and Technical Committees.)

The Regional Director and/or his deputy in Lusaka attended meetings of the following committees in Northern Rhodesia during the year:

Farmers' Debt Adjustment Board.
Eastern Province Loans Co-ordinating Committee. (Chairman.)
Tsetse and Trypanosomiasis Committee.
Natural Resources Board. (Advisory.)
African Affairs Sub-committee of the Natural Resources Board.
Education Sub-committee of the Natural Resources Board.
Drainage Sub-committee of the Natural Resources Board.
Regional Planning Sub-committee of the Natural Resources Board.
Bush Encroachment Sub-committee of the Natural Resources Board.

The Senior Tobacco Extension Officer in Northern Rhodesia served on:

The Eastern Province Loans Co-ordinating Committee.
The Central African Turkish Tobacco Association.

The Senior Animal Husbandry Extension Officer in Northern Rhodesia served on:

The Livestock Improvement Committee. (Chairman.)

Other Committees and Boards in Northern Rhodesia on which officers served were:

Regional Planning Sub-committee of the Natural Resources Board—Regional Conservation and Extension Officer and Planning Officer (Advisory).
Water Board of Northern Rhodesia—Senior Conservation Engineer (Member) and Irrigation Officer (Advisory).
Copperbelt Lands Advisory Committee—Group Conservation and Extension Officer (Advisory).
Northern Rhodesia Irrigation Development Committee—Irrigation Officer, Planning Officer and Regional Conservation and Extension Officer. (Chairman.)
Experimental Farms Advisory Committees—Regional Conservation and Extension Officer. (Chairman.)

In addition, officers attended meetings of councils, commodity committees of the Northern Rhodesia Branch of the National Farmers' Union and, like their colleagues in Southern Rhodesia, assisted the committees of various agricultural show societies.

PUBLICATIONS

	Title	*Author*	*Publication*
1.	Eluvial Chrome Mining: a preliminary study of the effects of eluvial chrome mining on the Great Dyke, with reference to water, soil and plant relationships on disturbed and undisturbed areas.	M. A. Keech and J. M. Wark	*Rhodesia Agricultural Journal.*
2.	Possibilities of Vleis at Marandellas	R. Peacock	*Rhodesia Agricultural Journal.*
3.	Natural Revegetation of Reverted Tobacco Lands.	G. E. Rowe	*Rhodesia Agricultural Journal.*
4.	Veld Fire Control	D. M. Gammon	*Rhodesia Agricultural Journal.*
5.	Groundnut Growing in the Rhodesias and Nyasaland. Part IV.	H. C. Ducker and A. J. Spear	*Rhodesia Agricultural Journal.*
6.	Farm Records to Increase Profits. Parts 1, 2 & 3	G. B. Thorpe	*Rhodesia Agricultural Journal.*
7.	Growing Potential of Burley Tobacco . . .	Public Relations Officer . .	*Rhodesian Farmer* and *Tobacco Journal.*
8.	New Record Maize Yields	Public Relations Officer . .	*Rhodesian Farmer.*
9.	Groundnut Variety Trial	Public Relations Officer . .	*Rhodesian Farmer.*
10.	Young Farmers' Exchange Visits	Public Relations Officer . .	*Rhodesian Farmer.*
11.	Maize Variety Experiment	Public Relations Officer . .	*Rhodesian Farmer.*
12.	Off Season Maintenance of Tobacco Buildings	A. N. Pirie and F. du Toit .	*Rhodesian Farmer.*
13.	Coffee in the Eastern Districts	O. H. Jones	*Rhodesian Farmer.*
14.	A Simple Cattle Weigh Bridge	J. Cowburn	*Rhodesian Farmer.*
15.	Grading on Windecliff	D. H. Grobler	*Rhodesian Farmer.*
16.	Fire Guarding on Poltimore	J. H. Davidson	*Rhodesian Farmer.*
17.	Calf Rearing on the Chipinga Experiment Farm	J. M. Tweedie	*Rhodesian Farmer.*
18.	Dhal	A. J. Mullins	*Rhodesian Farmer.*
19.	A Review of Experience with Jackbeans . .	R. R. Graham	*Rhodesian Farmer.*
20.	Even Flow of Beef	J. H. H. Louwrens . . .	*Rhodesian Farmer.*
21.	A Note on Growing Maize in Rotation with Star Grass.	G. J. van der Meeberg . .	*Rhodesian Farmer.*
22.	Feeding Labour in the Lands	B. H. G. Duncan	*Rhodesian Farmer.*
23.	Stick Bulking Trolley	B. H. G. Duncan	*Rhodesian Farmer.*
24.	First Annual Quality Weaner/Feeder Sale at Macheke.	P. L. Turner	*Rhodesian Farmer.*
25.	Weekly Tobacco Bulletins	R. Hope, G. Westbury and Members of Work Planning Section.	*Rhodesian Farmer.*
26.	Aerial Photography in Land-Use Planning in the Federation of Rhodesia and Nyasaland.	Planning Branch	Presented to C.C.T.A. Symposium.
27.	The 1962–63 Crop	G. Westbury	*Rhodesia Tobacco Journal.*

Note.—In addition to the above-mentioned items many other articles were written by members of the Department and published in various newspapers or in the form of technical memoranda.

APPENDIX III

LIST OF INTENSIVE CONSERVATION AREAS AND GROUPS

SOUTHERN RHODESIA

Region	*Group*	*I.C.A.*
Mashonaland West	Karoi (North-West Hunyani)	Karoi South Karoi North Karoi Central
	Sinoia (South-West Hunyani)	Angwa North Angwa South Doma
	Banket Ayrshire (North-East Hunyani)	Eldorado Banket North Ayrshire South Ayrshire
	Darwendale (South-East Hunyani)	Trelawney Darwendale Gwebi-Hunyani
	Umvukwes (North Mazoe)	Horseshoe Umvukwes Centenary West
Mashonaland East	North Marandellas	Marandellas North Marandellas West Bromley
	South Marandellas	Wenimbi North Wedza South Wedza
	North-East Salisbury	Arcturus Ruwa Salisbury West
	South-West Salisbury	Salisbury South Norton Beatrice
	Mazoe West	Glendale Barwick Marodzi/Tatagura
	Mazoe East	Shamva Bindura Darwin
Matabeleland	Gwaai	Lower Khami Lower Umgusa Upper Khami Upper Umgusa Bubi Inyati
	Shangani	Essexvale Insiza Shangani Mchingwe
	Western	Plumtree Marula Figtree North Matopos Gwaai Matetsi
	Umzingwane	South Matopos Gwanda Filabusi Belingwe-Shabani Limpopo

LIST OF INTENSIVE CONSERVATION AREAS AND GROUPS—*continued*

SOUTHERN RHODESIA—*continued*

Region	*Group*	*I.C.A.*
Midlands	Gwelo	Gwelo East Selukwe Vungu Upper Ngesi Gwelo Tokwe
	Que Que	Umniati-Sebakwe Bembezaan Sessombi Battlefields
	Victoria	Chiredzi Nuanetsi Victoria Central Umshandige Victoria East Sabi Valley
	Umfuli	Selous Gadzema Suri Suri Umsweswe Umfuli Sokis
	Charter	Gutu Chatsworth Featherstone Enkeldoorn Umvuma
Eastern	South Mid-Eastern	Headlands Rusape Tsungwesi Odzi
	North Mid-Eastern	Mtoko Nyandora Macheke Mayo
	North Eastern	Inyanga Umtali North Umtali South Chinyika
	South Eastern	Cashel Chipinga Melsetter

Total: 98 Intensive Conservation Areas

NORTHERN RHODESIA

Group	*I.C.A.*
Zambezi	Livingstone Zimba (South Kalomo) Kalomo North Choma South Choma North
Mazabuka	Monze-Pemba Magoye Lower Kaleya Upper Kaleya Mazabuka Nega Nega
Lusaka	Chilanga East Chilanga West Lusaka West Lusaka East Lusaka North
Chisamba	Chisamba East Chisamba West/Mumbwa Mwomboshi
Broken Hill	Broken Hill South Broken Hill North Mkushi
Copperbelt	Chingola-Bancroft Ndola-Luanshya Kitwe-Mufulira
Fort Jameson	Fort Jameson

Total: 26 Intensive Conservation Areas

DETAILS REGARDING OPERATION OF LIVESTOCK IMPROVEMENT SCHEME

A. SOUTHERN RHODESIA

Purchase of Breeding Stock by the Committee on Behalf of Farmers

1. TOTAL (Cattle)

	1.10.61 to 30.9.62	*1.10.60 to 30.9.61*	*1.10.59 to 30.9.60*
Pedigree bulls	10 for £2,388	12 for £2,260	1 for £262 10s. 0d.
Pedigree females	—	—	—
Grade females	—	—	14 for £808
TOTAL	10 for £2,388	12 for £2,260	15 for £1,070 10s. 0d.

2. DETAILS OF BREEDS PURCHASED

	1.10.61 to 30.9.62	*1.10.60 to 30.9.61*	*1.10.59 to 30.9.60*
Bulls			
Africander	—	1 for £180	—
Aberdeen Angus	5 for £1,470	3 for £645	—
Friesland	—	1 for £400	1 for £262
Sussex	—	3 for £420	—
South Devon	—	2 for £300	—
Mashona	—	1 for £100	—
Shorthorn	—	1 for £215 10s. 0d.	—
Hereford	5 for £918	—	—
TOTAL	10 for £2,388	12 for £2,260 10s. 0d.	1 for £262

	1.10.61 to 30.9.62	*1.10.60 to 30.9.61*	*1.10.59 to 30.9.60*
Females:			
Friesland	—	—	—
Jersey	—	—	14 for £808
TOTAL	—	—	14 for £808

3. SHEEP PURCHASED (Rams and Ewes)

	1.10.61 to 30.9.62	*1.10.60 to 30.9.61*	*1.10.59 to 30.9.60*
German merino rams	1 for £25	—	1 for £36
Dorper rams	13 for £232	11 for £165	29 for £453
South Down rams	—	1 for £40	—
Dorper ewes	—	20 for £120	—
TOTAL	14 for £257	32 for £325	30 for £489

IMPORTATION OF STOCK FROM REPUBLIC OF SOUTH AFRICA

(*a*) *Stock imported by the Committee and farmers combined on Essentiality Certificates issued by the Department of Conservation and Extension, excluding imports on special permits granted by the Republic authorities*:

	1.10.61 to 30.9.62	*1.10.60 to 30.9.61*	*1.10.59 to 30.9.60*
Pedigree Bulls:			
Ayrshire	1	—	1
Friesland	4	8	18
Guernsey	2	—	—
Jersey	1	7	14
Aberdeen Angus	8	9	3
Africander	97	80	90
Hereford	60	5	2
Shorthorn	4	4	4
Sussex	22	26	1
South Devon	—	2	2
Red Poll	1	—	—
Brown Swiss	—	—	2
Brahman	2	1	—
Dexter	—	—	—
Siementhalar	—	—	2
North Devon	—	—	—
Limousin	2	—	—
Santa Gertrudis	7	—	—
Charollaise	1	—	—
Lincoln Red	7	—	—
TOTAL	219	142	139

DETAILS REGARDING OPERATION OF LIVESTOCK IMPROVEMENT SCHEME—*continued*

Pedigree Females:	*1.10.61 to 30.9.62*	*1.10.60 to 30.9.61*	*1.10.59 to 30.9.60*
Friesland	9	4	45 + 4 calves
Guernsey	2	—	—
Jersey	—	18	84
Africander	—	12	90 + 4 calves
Sussex	34	15	—
Brown Swiss	—	—	9
Red Poll	—	—	12 + 2 calves
Hereford	27 + 6 calves	4 + 2 calves	12 + 2 calves
Dexter	6 + 2 calves	—	—
Siementhalar	—	—	—
Aberdeen Angus	21	—	—
Brahman	2 + 2 calves	—	—
TOTAL	101 + 10 calves	53 + 2 calves	252 + 12 calves

Grade Females:	*1.10.61 to 30.9.62*	*1.10.60 to 30.9.61*	*1.10.59 to 30.9.60*
Friesland	1	—	370 + 7 calves
Jersey	4 + 1 calf	4	168 + 6 calves
Dexter	—	—	—
Brown Swiss	—	—	—
TOTAL	5 + 1 calf	4	538 + 13 calves

(*b*) *Stock imported from Republic of South Africa on Special permits issued by the Republic Authorities*:

Pedigree Bulls:	*1.10.61 to 30.9.62*	*1.10.60 to 30.9.61*	*1.10.59 to 30.9.60*
Africanders	—	—	7
Aberdeen Angus (Red)	—	1	—
TOTAL	—	1	7

Pedigree Females:	*1.10.61 to 30.9.62*	*1.10.60 to 30.9.61*	*1.10.59 to 30.9.60*
Africanders	—	—	99 + 4 calves
Aberdeen Angus (Red)	—	9	—
TOTAL	—	9	99 + 4 calves

Grade Bulls:	*1.10.61 to 30.9.62*	*1.10.60 to 30.9.61*	*1.10.59 to 30.9.60*
Africander	—	10	22
Santa Gertrudis	—	—	3
Yellow Africander	—	—	2
TOTAL	—	10	27

Grade Females:	*1.10.61 to 30.9.62*	*1.10.60 to 30.9.61*	*1.10.59 to 30.9.60*
Jersey	—	8 + 4 calves	—
Red Africander	895 + 275 calves	—	—
Yellow Africander	—	—	28 + 10 calves
Aberdeen Angus (Red)	—	90	—
Friesland	—	1	—
Shorthorn	—	1	—
TOTAL	895 + 275 calves	100 + 4 calves	28 + 10 calves

DETAILS REGARDING OPERATION OF LIVESTOCK IMPROVEMENT SCHEME—*continued*

CATTLE IMPORTED FROM OVERSEAS

	1.10.61 to 30.9.62			*1.10.60 to 30.9.61*			*1.10.59 to 30.9.60*		
United Kingdom:	*Bull*	*Cow*	*Heifer*	*Bull*	*Cow*	*Heifer*	*Bull*	*Cow*	*Heifer*
Ayrshire	—	—	—	1	—	—	—	—	—
Jersey	2	—	1	1	—	—	2	—	2
Aberdeen Angus	—	—	—	—	—	—	—	—	—
Hereford	4	—	—	1	—	—	1	—	—
Shorthorn	—	2	—	—	—	—	—	—	—
Sussex	—	—	—	—	—	—	—	—	—
Red Poll	—	—	—	—	—	—	—	—	—
Friesland	2	—	—	—	—	—	1	—	1
TOTAL	8	2	1	3	—	—	4	—	3
Holland:									
Friesland	—	—	—	1	—	3	1	—	—
TOTAL	—	—	—	1	—	3	1	—	—
U.S.A.:									
Hereford	—	—	—	—	—	—	1	—	—
Brangus	2	2	1	—	—	—	—	—	—
Brahman	8	10	—	—	—	—	—	—	—
TOTAL	10	12	1	—	—	—	1	—	—
Canada:									
Jersey	—	—	—	—	—	—	1	—	—
TOTAL	—	—	—	—	—	—	1	—	—
GRAND TOTAL OVERSEAS	18	14	2	4	—	3	7	—	3

B. NORTHERN RHODESIA

Essentiality Certificates Issued by Livestock Improvement Scheme Committee

Pedigree beef bulls	43	Pedigree boars	10
Pedigree dairy bulls	16	Rams	23
Pedigree dairy females	20	Ewes	153

Stock Imported into Northern Rhodesia during the period 1.10.61 to 30.9.62
Pedigree Stock

No.	*Breed*	*Sex*	*Ex Source*
8	Friesian	Bulls	Republic of South Africa
14	Africander	Bulls	Republic of South Africa
3	Hereford	Bulls	Republic of South Africa
3	South Devon	Bulls	Republic of South Africa
1	Jersey	Bull	Republic of South Africa
20	Friesian	Heifers	Republic of South Africa
1	Shorthorn	Bull	Scotland

APPENDIX V

MECHANICAL PROTECTION OF ARABLE LAND

SOUTHERN RHODESIA

Region	*Period*	*Contours, Ridges and Storm Drains (miles)*	*Bench Terrace (miles)*	*Irrigation Furrows (miles)*	*Drainage Pasture Furrows (miles)*
Mashonaland	1955–56	3,312	1	52	1
	1956–57	3,327	2	21	—
	1957–58	3,137	1	41	7
	1958–59	3,356	—	24	—
	1959–60	3,528	—	37	—
	1960–61	3,928	—	39	286·3
	1961–62	3,868	2	19	184·0
Midlands	1955–56	737	5	33	412
	1956–57	703	13	36	24
	1957–58	760	2	22	5
	1958–59	754	6	40	62
	1959–60	708	2	34	24
	1960–61	765	14	49	14
	1961–62	726	17	42	22
Matabeleland	1955–56	104	12	11	14
	1956–57	158	1	11	—
	1957–58	395	9	21	—
	1958–59	350	2	13	1
	1959–60	309	2	22	2
	1960–61	292	0·3	14	—
	1961–62	330	—	9	—
Eastern	1955–56	1,555	12	39	2
	1956–57	1,558	10	56	2
	1957–58	1,818	9	54	—
	1958–59	1,664	5	34	3
	1959–60	1,484	—	63	—
	1960–61	1,494	—	42	—
	1961–62	1,271	—	34	—
Totals	1955–56	5,708	30	135	429
	1956–57	5,746	26	124	26
	1957–58	6,110	21	138	12
	1958–59	6,124	13	111	66
	1959–60	6,029	4	156	26
	1960–61	6,479	14·3	144	300·3
	1961–62	6,195	19·0	104	206·0

NORTHERN RHODESIA

Region	*Ridges (Contour) (yards)*	*Storm Drains (yards)*	*Roads (yards)*	*Waterways (yards)*	*Irrigation Furrows (yards)*
Kitwe	13,799	1,050	—	—	—
Chisamba	37,750	23,100	—	2,632	1,150
Lusaka	65,453	7,533	6,000	3,060	4,480
Mazabuka	36,093	4,300	—	1,450	1,700
Zambezi	190,784	1,680	32,033	4,600	1,000
Fort Jameson	104,756	2,252	—	—	—
Broken Hill	113,207	5,833	5,400	1,810	400
Totals:					
1956–57	913,700	133,800	149,200	—	—
1957–58	1,175,373	100,673	399,144	50,283	102,618
1958–59	754,322	135,634	301,600	63,843	39,526
1959–60	860,145	98,237	306,510	45,018	22,336
1960–61	728,701	165,383	129,640	59,560	14,647
1961–62	561,842	45,748	43,433	13,552	8,730

APPENDIX VI

WATER CONSERVATION STATISTICS

SOUTHERN RHODESIA

Region	*Period*	*No. of Dams*	*Aggregate Capacity in Gallons*	*Average Capacity Per Dam in Gallons*
Mashonaland	1955–56	80	621,300,000	7,766,000
	1956–57	72	399,020,000	5,542,000
	1957–58	105	473,928,000	4,513,000
	1958–59	85	605,000,000	7,000,000
	1959–60	163	1,000,499,000	6,138,000
	1960–61	133	1,648,650,000	12,396,000
	1961–62	73	965,770,000	13,228,000
Midlands	1955–56	95	464,705,000	4,892,000
	1956–57	77	781,850,000	10,284,000
	1957–58	84	253,360,000	3,016,000
	1958–59	83	552,590,000	6,657,000
	1959–60	172	1,916,960,000	11,145,000
	1960–61	180	1,471,980,000	8,178,000
	1961–62	94	587,110,000	6,246,000
Matabeleland	1955–56	153	527,300,000	3,450,000
	1956–57	142	679,200,000	4,783,000
	1957–58	138	832,000,000	6,631,000
	1958–59	208	1,435,630,000	6,902,000
	1959–60	389	2,279,000,000	5,833,000
	1960–61	287	1,729,450,000	6,026,000
	1961–62	91	533,500,000	5,800,000
Eastern	1955–56	25	34,700,000	1,388,000
	1956–57	20	100,565,000	5,028,000
	1957–58	39	23,600,000	605,000
	1958–59	37	103,000,000	3,000,000
	1959–60	54	269,650,000	5,000,000
	1960–61	72	477,530,000	6,632,000
	1961–62	17	73,000,000	4,300,000
Totals	1955–56	353	1,648,005,000	4,680,000
	1956–57	311	1,960,635,000	6,304,000
	1957–58	361	1,582,888,000	4,520,000
	1958–59	413	2,696,220,000	5,890,000
	1959–60	778	5,466,109,000	7,026,000
	1960–61	672	5,327,610,000	7,928,000
	1961–62	275	2,159,380,000	7,852,000

BY WHOM DAMS WERE CONSTRUCTED IN SOUTHERN RHODESIA

Year	*Farmers and Contractors*		*I.C.A. Committee Units*		*Government Units*		*Total No.*
	No.	*Per cent.*	*No.*	*Per cent.*	*No.*	*Per cent.*	
1955–56	130	36·9	84	23·8	139	93·3	353
1956–57	146	46·9	50	16·1	115	37·0	311
1957–58	253	70·1	42	11·6	66	18·3	361
1958–59	286	69·2	32	7·8	95	23·0	413
1959–60	585	75·2	18	2·3	175	22·5	778
1960–61	535	79·6	6	0·9	131	19·5	672
1961–62	242	88·0	4	1·5	29	10·5	275

NORTHERN RHODESIA

Period	*Total Number of Dams Constructed*	*Aggregate Capacity in Gallons*
1956–57	57	128,966,000
1957–58	58	162,290,000
1958–59	38	336,750,000
1959–60	55	558,750,000
1960–61	39	551,750,000
1961–62	55	708,750,000

BY WHOM DAMS WERE CONSTRUCTED IN NORTHERN RHODESIA

Period	*Farmer Built*		*Government Built*	
Totals	*No.*	*Aggregate Capacity in Gallons*	*No.*	*Aggregate Capacity in Gallons*
1956–57	10	22,080,000	47	114,886,000
1957–58	17	59,290,000	41	103,000,000
1958–59	12	61,750,000	26	275,000,000
1959–60	9	46,750,000	46	512,000,000
1960–61	13	67,750,000	26	284,000,000
1961–62	6	7,000,000	49	701,750,000

APPENDIX VII

LIST OF FIELD TRIALS CARRIED OUT BY DEPARTMENT OF CONSERVATION AND EXTENSION IN 1961/62

Type	*Matabele-land*	*Mashona-land*	*Eastern*	*Midlands*	*Northern Rhodesia*	*Totals*
1. Fertilizer trials on general crops	—	1	4	—	2	7
2. Liming trials	1	1	—	—	1	3
3. Groundnut fertilizer/variety trials	—	6	2	1	5	14
4. Groundnut demonstration	6	—	—	—	—	6
5. Maize variety trials	—	4	3	3	6	16
6. Soya bean variety trials	—	—	—	—	5	5
7. Soya bean variety demonstrations	1	—	—	2	—	3
8. Sorghum variety trials	—	2	—	—	2	4
9. Sorghum seeding and spacing trials	—	—	—	1	2	3
10. Dahl variety demonstrations	4	4	—	1	4	13
11. Lucerne variety trials	—	—	1	—	—	1
12. Lucerne demonstrations	—	—	—	2	—	2
13. Horticultural crop trials	—	—	4	—	2	6
14. Flue-cured tobacco fertilizer trials	—	5	—	—	1	6
15. Flue-cured tobacco variety/resistance to disease trial	—	—	1	—	—	1
16. Flue-cured tobacco spacing and topping trial	—	—	—	—	1	1
17. Burley tobacco fertilizer trial	—	—	—	—	1	1
18. Burley tobacco variety trial	—	—	—	—	1	1
19. Burley tobacco date-of-planting trial	—	—	—	—	1	1
20. Cigar wrapper leaf tobacco trial	—	—	—	—	1	1
21. Demonstrations of fodder crops other than lucerne	8	6	1	2	6	23
22. Veld and pasture demonstrations	2	1	1	—	1	5
23. Maize streak control observational trial	—	—	1	—	—	1
24. Cotton fertilizer/spraying demonstration	—	—	—	—	2	2
25. Drainage trials	1	11	3	5	—	20
26. Observational trial with various legume inoculants	—	1	—	—	—	1
27. Bush control trials	2	—	1	—	1	4
28. Weed control trials	—	—	—	1	1	2
29. Soil moisture conservation trial	2	—	—	—	—	2
30. Livestock trials and demonstrations	5	5	—	—	2	12
31. Run-off trials	—	2	1	—	—	3
TOTALS	32	49	23	18	48	170

APPENDIX VIII

ADVISORY VISITS: 1st OCTOBER, 1961, TO 30th SEPTEMBER, 1962

SOUTHERN RHODESIA

Purpose of Visit	*Mashona-land*	*Matabele-land*	*Midlands*	*Eastern*	*Total*
Pegging					
1. Contours	1,626	168	372	625	2,791
2. Storm drains	42	12	56	7	117
3. Grass strips	80	14	20	7	121
4. Other (pasture furrows)	205	3	46	10	264
5. Roads—road drains	223	13	42	16	294
6. Irrigation works	79	65	101	73	318
7. Dams	504	186	427	136	1,253
TOTAL	2,759	461	1,064	874	5,158
Inspections					
1. Subsidy	37	58	74	13	182
2. Water Court	151	42	82	97	372
3. Roads	150	13	43	34	240
4. Timber cutting	7	—	11	3	21
5. Land settlement and Crown land	62	18	38	14	132
6. Sub-division of land	49	10	24	21	104
7. Seed	2	12	22	1	37
8. Livestock improvements	124	—	57	44	225
9. Livestock—other	135	77	51	92	355
10. Mechanical units	558	311	239	75	1,183
11. Miscellaneous	503	—	315	241	1,059
TOTAL	1,778	541	956	635	3,910

ADVISORY VISITS—*continued*

Purpose of Visit	*Mashonaland*	*Matabeleland*	*Midlands*	*Eastern*	*Total*
Advisory					
1. Field crops	3,561	428	1,994	1,283	7,266
2. Veld and pasture	136	141	78	22	377
3. Livestock	364	446	884	167	1,861
4. Irrigation	193	170	272	51	686
5. Conservation	1,157	169	541	234	2,101
6. Farm planning	2,293	563	704	425	3,985
TOTAL	7,704	1,917	4,473	2,182	16,276
Meetings					
1. I.C.A. and Group	581	269	378	206	1,434
2. Farmers' Associations meetings	171	83	110	77	441
3. Staff	479	112	235	188	1,014
4. Miscellaneous	400	251	144	235	1,030
TOTAL	1,631	715	867	706	3,919
Other Visits					
1. Research Stations	239	75	99	102	515
2. Farmers' days	408	175	232	167	982
3. With committees	133	173	144	174	624
4. With specialists	559	167	260	280	1,266
5. Miscellaneous	1,727	440	864	398	3,429
6. Field trials	676	225	449	365	1,715
TOTALS	3,742	1,255	2,048	1,486	8,531
GRAND TOTALS	17,614	4,889	9,408	5,883	37,794

NORTHERN RHODESIA

Meetings and Courses Attended	*1960/61*	*1961/62*
1. I.C.A. and Group Committees	378	324
2. Farmers' Associations	51	84
3. Road Board	18	18
4. Staff-Group and Regional	256	249
5. Agricultural Land Board	14	25
6. Young Farmers' Club	44	80
7. Miscellaneous	261	335
8. Natural Resources Board	48	63
9. Land Board	22	12
10. F.D.A.B.	113	91
11. Courses	152	367
Advisory		
1. Regional Planning	1,149	880
2. Farm Planning	198	266
3. L.I.S.	362	83
4. Cattle Bounty	—	167
5. Livestock General	—	560
6. Dairy Bonus	17	—
7. Poultry	—	256
8. General Crops	—	765
9. Tobacco Advisory	1,322	2,302
10. Tobacco Grading Sheds	22	22
11. Irrigation	68	330
12. Irrigation Layouts	115	146
13. Water Board	122	58
14. Seed Association	40	42
15. Horticulture	—	285
16. Pest Control	46	98
17. Mechanical Units	771	664
18. Roads	87	39
19. Agricultural Land Board	84	53
20. Land Bank	59	27
21. Cattle Bank	9	—
22. Water Conservation	—	168
23. Conservation Subsidies	101	6
24. Pegging	459	483
25. Experimental Station	371	553
26. Field Days	228	265
27. With Committee Members	157	152
Other Visits	*1960/61*	*1961/62*
28. F.D.A.B.	585	655
29. With V.I.P.s	329	450
30. Extension	2,070	148
31. Miscellaneous	901	673
TOTALS	11,029	12,247

APPENDIX IX

NORTHERN RHODESIA

REGIONAL PLANS COMMENCED DURING THE THREE-YEAR EXPERIMENTAL PERIOD ENDING 30th JUNE, 1957

Area and Plan Name and Number	*Acreage*	*Commencement Date*	*Completion Date*
Upper Kaleya (Upper Kaleya/2)	7,728	1.6.54	31.5.58
Upper Kaleya (Middle Kaleya/4)	57,884	1.6.54	31.5.58
West Lusaka (Cheta River/1)	31,121	1.9.54	31.8.58
West Lusaka (Chingola/3)	61,009	1.9.54	31.8.58
Northern Broken Hill (North Broken Hill/5)	110,161	1.5.55	31.10.58
Lower Kaleya (Lower Kaleya/6)	70,124	1.8.55	31.7.58
East Lusaka (Chalimbana/7)	100,729	1.7.56	30.6.58
Mazabuka (Mazabuka/8)	116,987	1.10.56	30.9.59
TOTAL	555,742		

In addition to the above, 10,053 acres were planned in 1952–53 in the Upper Kaleya Pilot Scheme, bringing the total acreage up to 30th June, 1957 to 565,795.

REGIONAL PLANS COMMENCED SUBSEQUENT TO THE 30th JUNE, 1957, UNDER THE OLD FEDERAL CONDITIONS

Area and Plan Name and Number	*Acreage*	*Commencement Date*	*Completion Date*
North Kalomo (Mukwela/10)	40,491	21.1.58	20.1.61
South Broken Hill (Munga River/11)	41,116	21.4.58	20.4.61
Zimba (Bowood East/9)	68,150	5.8.58	4.8.61
TOTAL	149,757		

PLANS COMMENCED SUBSEQUENT TO THE 30th JUNE, 1957, UNDER NEW FEDERAL CONDITIONS UP TO 30th SEPTEMBER, 1959

Area and Plan Name and Number	*Acreage*	*Date Approved*
West Lusaka (Molendemo N.W./12)	21,264	30.10.58
South Choma (Sibanyati/24)	30,000	15.1.59
North Lusaka (Lower Chongwe/50)	72,000	30.5.59
Monze-Pemba (Kazangula/33)	45,000	30.6.59
Magoye/Lower Kaleya/(West Kaleya)/39	26,258	20.6.59
Livingstone (Matetsi/15)	48,276	19.6.59
Mwomboshi (Miswa/56)	50,000	21.8.59
Livingstone (Maramba/14)	68,746	31.7.59
South Broken Hill (Nyama West/58)	64,132	4.9.59
Nega Nega (Lusito/40)	29,102	31.10.59
East Chisamba (Malo/54)	51,537	15.11.59
TOTAL	506,415	

REGIONAL PLANS COMPLETED FROM 1st OCTOBER, 1959, TO 30th SEPTEMBER, 1961, UNDER NEW FEDERAL CONDITIONS

Area and Plan Name and Number	*Acreage*	*Date Approved*
North Choma (Upper Mbabala/27)	56,920	20.5.61
Chilanga (Lilayi/45)	71,900	22.2.61
West Chisamba (East Wangwa/52)	78,381	1.12.60
Zimba (Bowood Luezi/17)	102,834	9.5.60
North Kalomo (Kalomo/21)	82,501	2.5.60
Monze-Pemba (Demu/31)	46,770	1.3.60
Magoye (Magoye/37)	79,043	24.9.60
West Lusaka (Molendemo West/46)	50,856	1.8.60
East Lusaka (Mwanza/48)	53,808	22.7.60
East Chisamba (Upper Chongwe/53)	37,711	20.7.60
South Broken Hill (Nyama/57)	49,402	11.8.60
Chilanga (Dem/44)	91,670	12.6.61
Nega Nega (Nega Nega/41)	154,767	29.4.61
North Kalomo (Mwemba/20)	129,784	15.6.61
West Chisamba	73,802	3.12.60
TOTAL	1,480,980	

NORTHERN RHODESIA—*continued*

REGIONAL PLANS COMPLETED SUBSEQUENT TO THE 30th SEPTEMBER, 1961, UNDER NEW FEDERAL CONDITIONS

Area and Plan Name and Number	*Acreage*	*Date Approved*
Livingstone (Sinde/13)	20,400	10.1.62
Monze-Pemba (Monze/36)	89,661	20.5.61
North Lusaka (Ngwerere/49)	46,353	11.9.61
South Choma (Tara Batoka/30)	129,900	28.9.61
Upper Kaleya (Mbaya/38)	34,317	10.5.62
Zimba (Ngwesi/18)	53,016	30.7.62
North Kalomo (Chilesha/19)	67,304	Not yet approved
North Choma (Sibanyati West/26)	61,388	13.8.62
Monze-Pemba (Chisekesi/34)	34,632	3.9.62
Chilanga (Shimbabala/43)	84,614	Not yet approved
West Lusaka (Chunga/47)	75,459	Not yet approved
Mwomboshi (Mulembo/55)	38,100	Not yet approved
Mkushi (Mumshiwemba/60)	143,695	Not yet approved
TOTAL	558,808	

REGIONAL PLANS BEING WORKED ON IN NORTHERN RHODESIA

North Choma (Mbabala/28)
North Choma (Sikalonga North/29)
West Chisamba (Lower Wangwa/51)

APPENDIX X

LIST OF FORMAL TRAINING SESSIONS ORGANIZED BY TRAINING SECTION IN CO-OPERATION WITH SPECIALISTS

Dates		*Subject*	*Attendance*						
From	*To*		*Conex*	*Farmers*	*Teachers*	*Y.F.C. Leaders*	*Y.F.C. Members*	*Other Depts.*	*Total*
2/10	5/10	Work Study	11	—	—	—	—	—	11
13/10	15/10	Turkish Tobacco	5	—	—	—	—	—	5
21/10	23/10	Y.F.C. Admin. (N.R.)	—	—	—	18	—	1	19
30/10	2/11	Virginia Tobacco (1)	18	—	—	—	—	—	18
3/11	5/11	Y.F.C. Administration	—	—	—	22	—	—	22
8/11	—	Y.F.C. Field Day	—	—	—	3	18	—	21
29/11	1/12	Farm Planning Refresher	10	—	—	—	—	3	13
4/12	8/12	Training Methods	19	—	—	—	—	—	19
11/12	15/12	Farm Management	28	—	—	—	—	—	28
12/12	14/12	Virginia Tobacco (2)							
18/12	19/12	Farm Management	14	—	—	—	—	—	14
21/12	22/12	Farm Management	8	—	—	—	—	—	8
2/1	3/1	Farm Management	15	—	—	—	—	1	16
4/1	5/1	Farm Management	11	—	—	—	—	—	11
8/1	9/1	Farm Management	19	—	—	—	—	—	19
8/1	11/1	Y.F.C. Administration	3	—	—	2	—	3	8
11/1	12/1	Farm Management	20	—	—	—	—	6	26
15/1	26/1	Course II (Biological)	22	—	—	—	—	—	22
22/1	26/1	Virginia Tobacco (3a)							
29/1	2/2	Virginia Tobacco (3b)							
5/2	9/2	Farm Management	17	—	—	—	—	—	17
12/2	16/2	Y.F.C. Administration	13	—	—	—	—	—	13
19/2	23/2	Virginia Tobacco (4)							
2/3	4/3	Y.F.C. Administration	1	—	—	16	—	1	18
5/3	16/3	Course II (Biological)	22	—	—	—	—	8	30
17/3	—	Poultry Field Day	1	2	—	5	60	—	68
20/3	22/3	Virginia Tobacco (5)							
21/3	23/3	Farm Planning Refresher	15	—	—	—	—	—	15
9/4	19/4	Course III (Farm Planning)	16	—	—	—	—	8	24
8/5	10/5	Farm Planning Refresher	21	—	—	—	—	—	21
14/5	18/5	Virginia Tobacco (6)							
14/5	24/5	Extension Methods—for S.A.R.C.C.U.S.	11	—	—	—	—	38	49
28/5	1/6	Extension Methods	15	—	—	—	—	—	15
29/5	31/5	Farm Planning Refresher	13	—	—	—	—	—	13
19/6	29/6	Course I (Mechanical)	16	—	—	—	—	—	16
23/6	—	Y.F.C. Training Rally	—	—	—	10	100	5	115
2/7	—	Y.F.C. Training Rally	2	—	—	8	150	1	161
16/7	20/7	Extension Methods	14	—	—	—	—	—	14
17/7	18/7	Virginia Tobacco (1)	12	—	—	—	—	1	13
23/7	27/7	Farm Management	18	—	—	—	—	—	18
14/8	17/8	Virginia Tobacco (2)	Continuation of Course (1)						
28/8	2/9	Y.F.C. National Camp	—	—	—	10	150	—	160
4/9	7/9	Work Study	12	—	—	—	—	—	12
18/9	21/9	Virginia Tobacco (3)	Continuation of Courses (1) and (2)						
TOTAL:		44 TRAINING SESSIONS	422	2	—	94	478	76	1,072

Department of Veterinary Services Report for the Year ended 30th September, 1962

THE DEPARTMENT OF TSETSE AND TRYPANOSOMIASIS CONTROL AND RECLAMATION was integrated with Veterinary Services on the 1st May, 1961, becoming a branch of the Department. All members of the Department are fully appreciative of the advantages resulting from a joint body in the campaign against both vector and disease. Thus, although there are three separate units within the main framework, these being Field, Research and Tsetse and Trypanosomiasis Control, each is so interwoven with the other in diagnostic and control matters that they function as one unit.

Reports on the three branches follow in full and it is necessary only to comment on some of the more important aspects of the information which is given.

STAFF

Professional staff of both veterinarians and entomologists proved difficult to recruit and maintain in the Service. In the case of the former the year ended with a shortfall of nine (Field four and Research five) out of a total establishment of 40, and in the case of the latter there was a shortfall of three out of nine. Endeavours were made by advertisement and by personal contacts to recruit personnel either on a permanent or on a contract basis, and the indications towards the end of the year were very hopeful. It is gratifying to record that Mr. H. Thornton, an authority on meat inspection, joined the Department and is now responsible for the meat inspection side of the Department's work.

Government is to be congratulated on its foresight in making grants and loans available to young Rhodesians desirous of taking up veterinary science. The first of these scholarship students should qualify during the present calendar year, to be followed in the coming year by three and in the next year by four, thus assuring a steady intake of veterinarians in the future.

A new post was authorized of a veterinary zoologist for the purpose of undertaking research into disease in wild life, and this post has now been filled. In this connexion the Southern Rhodesia Government was approached and agreed to set up a joint committee of scientific officers under an independent chairman, to guide and co-ordinate the research to be undertaken by the respective game research officers of both the Federal and the Southern Rhodesia governments.

A shortfall of technical staff is recorded in respect of Meat Inspectors and Laboratory Technicians. The latter are now being trained locally and negotiations are in hand to establish training for meat inspectors.

The establishment of lay staff was augmented by 15 during the year. In order to attract and retain personnel, the number of senior posts was increased by 12 and the result of this action has made itself felt already.

DISEASES

Generally speaking, despite adverse conditions in the way of rainfall, it has proved a satisfactory year for both the agriculturalists and stockowners. From the animal disease aspect trypanosomiasis was the most troublesome. Two outbreaks of foot-and-mouth disease, caused by different viruses (S.A.T. I and II) in the south and south-east borders of the country, engaged the attention of the staff to the full and it is gratifying to record that all restrictions were removed before the end of the year.

Foot-and-Mouth Disease

Only the African types of foot-and-mouth disease have ever been recorded in this country, being S.A.T. I, II and III. The European and Asian types have never been recorded. The disease over the past two decades has become a border problem in the south and south-east, with only three outbreaks recorded in the west, all outbreaks being associated with game migration. In order to prevent further outbreaks, Government has embarked upon a scheme in the underdeveloped areas of game fencing to reduce to a minimum cattle/game contact, and at the same time of erecting strategic cattle fences to contain livestock and reduce the risk of spread of disease. The Department's methods of control have prevented infection gaining access to the more developed areas in the country.

The continued outbreaks of the disease in African and Asian countries led the International Office of Epizootics to recommend, in 1960, that the importation into

Europe of animals and animal products from Asia and Africa be prohibited. This sweeping recommendation has been accepted by most European countries with a resultant embargo on beef from African countries. The Federation's trade with Britain has continued, however, and efforts have been made to have the recommendation amended in respect of this country. A senior official of the Italian Veterinary Service paid a visit to the country and expressed himself as satisfied with the action and precautions taken here.

Inactivated vaccines are available for use against the European viruses and some of the exotic viruses. The Director of the World Reference Laboratory, Pirbright, produced an attenuated vaccine for use against S.A.T. I and II which has had extensive field trials in Africa with good results. This vaccine has not been used here simply because of the adverse attitude of the European authorities to the use of attenuated vaccines; however, we have seen the field trials in South Africa and were able to gauge the results.

Research is also being undertaken into the carriage and maintainance of virus in meat and meat products.

Tsetse and Trypanosomiasis

There is every indication that tsetse is on the advance in infested countries in Africa. In this country rapid spreads have been reported from Binga, Gokwe, Lupane and the Nuanetsi districts. The first three districts are contiguous and are part of the northern fly-belt, whereas the latter is in the south-eastern portion of the country. Elsewhere the position was static and in some areas the Department's efforts proved successful. The overall picture is most encouraging. For some years past the distasteful policy of game destruction has been dropped but in one area during the year a 200 square-mile block was fenced off and certain species of game driven out before sealing the fences. This was done in support of two other methods of attack—bush clearing and insecticidal spraying—and is more in the nature of an experiment to find out whether the selected game animals which have been allowed to remain will support the fly population.

The position on the southern fly-front which threatens the Limpopo Valley resulted in the setting up of a joint working party comprising of the authorities from Moçambique, the Republic of South Africa and the Federation, to formulate a policy for a combined attack under one control. It is hoped in the near future to establish an inter-territorial standing committee to carry out this work.

On the trypanosomiasis aspect there were over 100,000 head of cattle at risk, of which only 1,614 head were proved infected on smear examination.

A considerable amount of research has been undertaken on the vector and on the disease itself by the Department. Close collaboration has been maintained with the University College research workers and also with those of the Agricultural Research Council.

Rabies

The general position within the country is satisfactory, but 18 positive cases were confirmed from our border areas, mainly in the east and west. It is interesting to record that two positive cases were confirmed in dogs twice vaccinated, but in which the last vaccination had been effected over three years previously. This suggests a waning of immunity and as a result dogs last vaccinated more than three years ago now have to be revaccinated.

Tuberculosis

The incidence of infection amongst cattle tested during the year is given at 0.21 per cent. Of 260,793 head of cattle slaughtered at the Cold Storage Commission abattoirs only two carcasses were totally condemned and, of 104,596 porcine carcasses, 24 were condemned. From these figures it is clear that the incidence of tuberculosis is low. Efforts should now be directed towards area eradication with eventual total eradication. If a policy of this nature is accepted private practitioners would be able to assist as has been done elsewhere. It is understood that European meat-importing countries are to demand, in view of their own freedom from bovine tuberculosis, that importations from tuberculosis-free countries only should be permitted. It is therefore in this country's own interests to adopt a policy which will lead to eventual eradication.

African Swine Fever

For the first time the disease was confirmed in this country. For some years the incidence of the disease in neighbouring territories has been noted and it came as no surprise when confirmed on the northern border. The disease was stamped out by slaughter.

VETERINARY RESEARCH

Owing to the severe shortage of personnel in this sphere, research was confined to poisonous plants, groundnut poisoning and low infertility in ranch cattle. It is regretted that it was not possible to undertake the Bovine Fertility Survey outlined by the Agricultural Research Council.

Salmonellosis

As a result of a recommendation made at the last meeting of O.I.E. on this condition a bacteriological survey was undertaken of gall bladders from animals passing through the Cold Storage Commission abattoirs. Of one thousand and eight bile samples cultured, only three positives were recorded, which is considered very satisfactory.

CONFERENCES

The following conferences were attended during the year:

- Inter-Territorial (Bechuanaland/Southern Rhodesia) Foot-and-Mouth Disease Meeting.
- Council Meeting of the Inter-African Bureau for Animal Health.
- Inter-African Advisory Committee for Animal Health.
- International Scientific Committee for Trypanosomiasis Research.
- Commonwealth Chief Veterinary Officers' Conference.
- British Veterinary Association Congress.
- Annual Congress of the International Office of Epizootics.

VETERINARY FIELD BRANCH

STAFF

The Field Establishment of 30 professional officers had four vacancies at the end of the year. There were no resignations during the year but one resignation was in hand to take effect on 30th September, 1962. Fortunately two former members of the Department accepted short-term contract posts or the position would have been even worse. Widespread advertising of the vacant field posts has given little hope of permanently filling the establishment immediately.

From the end of 1963 onwards, the Branch should profit by the return to Government employment of a steady stream of young Rhodesians who have received financial assistance with their studies to graduate as veterinary surgeons.

Twenty-seven veterinary surgeons were actively employed in private practice, and two in commercial employment.

Animal Health Inspectors

The year opened with one and closed with six vacancies. The establishment was increased by 15 in July, 1962, to intensify inspections and control in the areas prone to foot-and-mouth disease.

New appointments	18
Superannuations	1
Resignations	5
Transfers	1
Discharges	1

Meat Inspection

The filling of the four vacancies proved impossible and only one recruit was appointed during the year. With the increased development of the beef industry, staff has been under extreme pressure and local training of recruits is now under active consideration.

Mr. Thornton accepted a further three-year contract as Senior Meat Inspection Adviser and his services are materially contributing to the advancement of the beef export drive.

GENERAL

Climate, Food and Water Supplies, and Condition of Stock

With the exception of the Lomagundi District, abnormal rains severely prejudiced agricultural activities. High prevailing temperatures were associated with early rains and followed by a prolonged midsummer drought. Late rains resumed in mid-January and were abruptly terminated by cyclonic downpours. A complete absence of sporadic winter rains supervened and high temperatures throughout the winter sorely depleted available grazing, especially on the highveld. Water supplies were a problem in several districts towards the end of the year. Many dams had not filled up, running rivers became pools only and borehole flows dropped abruptly. Near-drought conditions persisted in the south-west of the country throughout the major part of the year.

Owing to midsummer drought, grazing did not bolt and proved surprisingly adequate throughout the year. Widespread veld fires, especially on the highveld, precipitated poverty conditions in overstocked areas later in the year. Despite adverse conditions, a near record maize crop was reaped, but many drought-stricken early crops were advantageously converted to silage.

Stock generally did well and supplementary feeding of steers and weaners markedly increased. The basic principle of supplementation of nutrition in breeding herds, surprisingly, is still overlooked in many areas with resultant low calf crops.

Incorporation of grass leys into crop rotations on tobacco farms stimulated cattle production in many areas and the major increase was in beef cattle.

At the end of the year concern was widespread in the east highveld and south-west lowveld at the prospect of poverty losses in adult breeding stock if early rains did not fall.

Tick Life and Dipping

The unfavourable micro-climates and lack of the customary midsummer damp basal mat of dense vegetation prevented the usual build-up of rhipicephalids (brown and red ticks), but the mild winter, with lack of frost gave an enhanced breeding season to boophilids (blues), necessitating many quarantine measures.

A more considered and reasoned approach to the use of the new tickicides is evident amongst farmers but their tendency to rely on the effectiveness of these new preparations so as to extend dangerously the intervals between dipping, has led to breakdowns in control.

Except in the near-drought areas where no water was available for dipping, control in general was satisfactory.

Quarantine Notices (Tick Infestation)

Veterinary Districts: Bulawayo, 93; Salisbury, 245; Fort Victoria, 126; Gwelo, 221; Umtali, 38; Chipinga, 64; Sinoia, 115; Gwanda, 41; Total, 943.

Contraventions

	Bulawayo	*Salisbury*	*Fort Victoria*	*Gwelo*	*Umtali*	*Chipinga*	*Sinoia*	*Gwanda*	TOTAL
Animal Health Act . . .	145	24	68	1	357	6	55	90	746
Animal Health Regulations .	397	86	149	179	100	52	223	106	1,292
Cruelty Act	—	1	—	—	—	1	9	1	12
Law and Order Maintenance Act	—	—	—	—	1	—	—	—	1
Stock Theft Act	—	—	—	—	—	—	—	1	1
TOTAL . . .	542	111	217	180	458	59	287	198	2,052

Livestock Inspections

The total number of cattle inspected by members of staff during the year, under the Animal Health Act, was 22,032,095.

SPECIFIED DISEASES

VIRAL AND RICKETTSIAL DISEASES

Foot-and-Mouth Disease

The outbreak of S.A.T. I involving Matobo, Gwanda and Insiza districts showed no further spreads and the cordon was lifted on 31st October, 1961.

A heavy movement of wildebeeste and buffalo from Buffalo Bend on Nuanetsi River up to the Bubye River ranches, following rains, was soon followed by confirmation of foot-and-mouth in cattle and small stock, typed S.A.T. II on 16th November, 1961, at Mlelezi Ranch, Nuanetsi District.

Despite efforts to localize the disease by cordon and cattle-free breaks, it gradually spread through Special Native Area "B", Nuanetsi, and the adjoining ranches to the east and west.

Heavy concentrations of game (impala, kudu and wildebeeste) were moving up to the Bubye River headwaters and patent infection was seen in all these species of antelopes.

Infection also appeared in sheep and goats. The following virusing was effected with satisfactory results.

	Cattle	*Sheep and Goats*
Special Native Area "B", Nuanetsi . .	25,179	5,877
Bubye Ranches, Nuanetsi	17,613	3,944
Liebig's Ranch, Beitbridge	42,811	248

All quarantine restrictions in respect of this outbreak were withdrawn on 28th September, 1962.

On 1st February, 1962, infection was confirmed at Chilonga Matibi Reserve No. II, Nuanetsi District, and was typed as S.A.T. I. A very mild infection was noted in sheep and goats. Trading in small stock had already spread infection to the adjoining ranches in Southern Ndanga with further dissemination to the Sangwe and Ndanga East Native Reserve through the movement of meat.

The following were effectively virused:

	Cattle	*Sheep and Goats*
Matibi Reserve No. II, Nuanetsi . . .	9,715	5,194
South Ndanga Ranches	13,430	2,890
Sangwe Native Reserve	3,159	1,176
Ndanga East Native Reserve	2,699	709

The cattle fence erected as a foot-and-mouth control measure by the Veterinary Department in 1956 proved an extremely effective cordon line and for the first time it was possible to stop the heretofore automatic spread from the South Ndanga ranches to the Ndanga Native Reserve.

The Sabi River being in flood materially contributed to control on the east.

All restrictions in respect of this outbreak were lifted on 31st August, 1962.

Rabies

The following cases were confirmed during the year:

Native District	*Number of Cases*	*Species*	*State of Vaccination*
Gwanda	1	Dog	Unvaccinated stray
Chipinga	4	Dogs	2 unvaccinated strays 1 unvaccinated puppy 1 vaccinated twice
Bulalima Mangwe	1	Dog	Unvaccinated stray
Lupane	3	Dogs	Unvaccinated strays
Wankie	2	Dogs	Unvaccinated strays
Umtali	2	Dogs	1 vaccinated once 1 vaccinated twice
	1	Calf	Unvaccinated
Makoni	3	Dogs	2 unvaccinated strays 1 vaccinated once
Mtoko	2	Dogs	Unvaccinated strays
Salisbury	1	Cat	Nyasaland import in quarantine. Unvaccinated.

Positive results according to species; 18 dogs, 1 cat, 1 calf.

In addition, a positive dog specimen was submitted from the adjoining border town of Machipanda, Moçambique.

The majority of cases were from the border areas, mainly the eastern border adjoining Moçambique, wherein it was very evident that the disease was endemic immediately adjoining the border. The contiguous native areas in Southtern Rhodesia were repeatedly invaded by mad dogs on the run and two African children were reported to have been bitten and died, it is expected from rabies. Tie-up orders with compulsory revaccination of all dogs were imposed in these areas.

In view of the positives in two dogs, twice vaccinated, but in which the last vaccination had been more than three years previously, revaccination of all twice-vaccinated dogs is now being imposed at the end of the third year after the last vaccination.

Following the resistance to vaccination of dogs in tribal areas, 488 prosecutions and the destruction of 59 non-vaccinated dogs, resulted in satisfactory submissions for vaccination, a total of 364,976 dogs being vaccinated this year, c.f. 83,828 and 141,959 in the two previous years.

Vaccinations since July, 1951, now total 1,588,417.

The rise in incidence of positive cases stresses the necessity of maintaining maximal cover on the borders.

Year	*1954*	*1955*	*1956*	*1957*	*1958*	*1959*	*1960*	*1961*	*1962*
Specimens—submitted . .	474	264	181	208	165	117	112	78	112
positive . .	183	100	50	50	41	28	15	7	20

Contagious Epididymitis and Vaginitis

One new centre of infection was found in a dairy herd in the Salisbury District only. Elsewhere incidence remains confined to a few ranches with a low clinical incidence, a very low level of wastage in bulls and little resultant infertility. Check of breeding bulls throughout the country was sustained.

Lumpy Skin Disease

A few mild cases were recorded, mainly in lowveld ranches, with general lack of any malaise of economic significance.

African Swine Fever

Heavy mortality in pigs was reported in two native areas at the north-eastern corner of the country—Dande Special Native Area and the western part of the Mzarabani Reserve.

Specimens were obtained from both areas and sub-inoculation by the Research Branch into pigs confirmed that first diagnosis of Arican Swine Fever in the country. It is highly probable that infection was introduced from Southern Nyasaland, as a migrant labour trail from that country crosses Moçambique and enters Southern Rhodesia at a point where mortality first occurred. Infection spread rapidly by the sale of infected meat and a total of 623 pigs died. Quarantine was imposed on the area and total of 32 survivors were slaughtered and burned, with compensation. No further spread was traced.

BACTERIAL DISEASES

Anthrax

No new centres were disclosed.

Gazetted Anthrax Areas—Annual Vaccinations:

District	*Cattle*	
Que Que	1,367	Third and final vaccinations
Matobo	267	
Wankie	970	
TOTAL	2,604	

Tuberculosis

(*a*)	Imports tested	4,946 cattle	37 reactors
(*b*)	Exports tested	463 cattle	2 indeterminate reactors
		2 pigs	no reactors

TUBERCULIN HERD TESTS

(*c*) OLD VOLUNTARY SCHEME

Veterinary District	*No. of Herds Under Test*	*No. of Cattle Under Test*	*No. of Reactors 1961/62*
Salisbury	34	1,274	—
Bulawayo	30	3,139	—
Umtali	18	1,233	—
Gwelo	7	805	—
Sinoia	4	723	—
TOTAL	93	7,174	—

(*d*) COMPENSATION SCHEME

Veterinary District	*No. of Herds Under Test*	*No. of Cattle Under Test*	*No. of Reactors 1961/62*
Salisbury	209	21,362	3
Bulawayo	45	2,543	7
Umtali	40	3,927	2
Gwelo	24	2,367	27
Chipinga	23	1,647	1
Sinoia	9	675	—
Gwanda	7	699	1
Victoria	26	1,972	—
TOTAL	383	35,192	41

(*e*) VOLUNTARY SCHEME (Beef herds)

Veterinary District	*No. of Herds Under Test*	*No. of Cattle Under Test*	*No. of Reactors 1961/62*
Salisbury	5	5,382	—
Bulawayo	1	163	—
Sinoia	2	160	—
TOTAL	8	5,705	—

Summary Agreement Testing

Dairy Herds:	
Total number of herds under test	476
Total number of cattle under test	42,366
Total number of reactors, 1961/62	41
Beef Herds:	
Total number of herds under test	8
Total number of cattle under test	5,705
Total number of reactors, 1961/62	nil

Twenty-nine herds were enrolled under the compensation scheme.

Forty-two herds were sold up, but not all the cattle were added to other dairy herds, many of the best being exported to Moçambique.

For the first time since the inception of the Tuberculosis Eradication Scheme, there was a drop of 13 in the total of tested herds, due to dispersal of the herds.

Of the 476 herds under test, 367 attained full attested status with long-term testing.

For various reasons 584 head were tested giving three reactors.

The ranch in Matabeleland where annual testing heretofore had reduced the incidence to 0.79 per cent. was not tested but check of sales, 4,287 weaners and steers, gave eight reactors on test, i.e. 0.18 per cent.

Of a total of 24,460 tuberculin tests performed on Rhodesian cattle, reactors amounted to 52, a percentage of 0.21.

Meat Inspection Incidence

Cold Storage Commission Abattoirs	*Carcase Condemnation*		*Part Condemnation*	
	Bovine	*Porcine*	*Bovine Viscera*	*Porcine*
Salisbury	1	—	—	—
Bulawayo	—	5	15	54
Umtali	—	—	—	—
Fort Victoria	1	1	9	—
TOTAL	2	6	24	54
Total Slaughterings	260,793		104,596	

Bovine Brucellosis

Veterinary districts . . . 321 premises tested.
Positive premises . . . Salisbury 26, Bulawayo 8, Gwelo 19, Umtali 6, Fort Victoria 1, Gwanda 2, Sinoia 7.
TOTAL = 69 = 21·5 per cent.
4,318 samples were tested with 364 positives.

Quarter Evil (Clostridium chauvoei)

Outbreaks were confirmed as follows:

Veterinary District	*Outbreaks*	*Deaths*
Gwelo	45	275
Salisbury	37	138
Sinoia	24	51
Umtali	20	55
Bulawayo	15	193
Chipinga	9	40
Victoria	7	64
Gwanda	6	130
TOTAL	163	946

The recorded deaths are only a minimum of actual mortalities as vaccination is seldom practised in many areas until an outbreak has been recognized. The practice of annual vaccination in African areas has been abandoned further, a markedly retrogressive procedure.

PROTOZOAL DISEASES

Trypanosomiasis

See the report for Tsetse and Trypanosomiasis Central Branch.

Theileriosis (Gonderia lawrencei)

Confirmed outbreaks:

Districts	*Centres*	*Deaths*
Salisbury	11	79
Gwelo	1	5
Sinoia	6	30
Umtali	3	37
Bulawayo	2	30
Victoria	4	33
TOTAL	27	214

Most new centres were on premises adjoining old outbreaks or where cattle had been bought from old centres, and allowed to become infested with rhipicephalids. The lack of control of ticks by faulty spraying-plants (hand and power) common to many of the new centres must be underlined. Few recurrences in old centres were noted.

FUNGAL DISEASES

Streptothricosis

Negligible occurrence reported.

DISEASES DUE TO MITES

Mange

Three outbreaks were recorded in both pigs and cattle.

An outbreak of sarcoptic mange was confirmed in wildebeeste *(Gorgon* sp.) on the western border.

Sheep Scab

Three outbreaks occurred which were speedily controlled by B.H.C. dipping and quarantine.

SPECIFIED POULTRY DISEASES

VIRAL DISEASES

Epidemic Tremor

No outbreaks occurred this season. In a flock of survivors from last year's outbreak it was noted that the advent of high daily temperatures with stress precipitated marked lameness and blindness.

BACTERIAL DISEASES

Fowl Cholera

Ten outbreaks were confirmed and 2,500 birds destroyed, with compensation.

It is notable that the line of infection occurs annually along the line of the Great Dyke, where birds are maintained under primitive conditions for use as protein supplementation in mining compounds, and the disease is speedily disseminated by trading of slaughtered affected birds.

Fowl Typhoid

Twelve major outbreaks were diagnozed, three of these being unfortunately in the native reserves in the Umtali area. It is impossible to assess the number of birds involved as the disease came to light only in a few commercial flocks in these reserves. With this proof of widespread incidence in areas, impossible of individual control, it is obvious that the testing-out slaughter policy will have to be abandoned and reversion to vaccination substituted.

Bacillary White Diarrhoea

No outbreaks were confirmed. One hundred and eight flocks were tested, a total of 87,607 birds, and certificates of freedom from disease were issued.

NON-SPECIFIED DISEASES

Ephemeral Fever

In common with all the summer month insect-borne diseases, this disease was very low in incidence as a result of the midsummer drought.

Vibrio Foetus

This was confirmed on 20 properties, 930 submitted tampons yielding 149 positives. Resultant infertility in the majority of herds is at a low level.

Paratyphoid

With the lack of the usual midsummer muddy kraals at the height of the calving season, remarkably few outbreaks were reported.

Heartwater

Confirmed incidence was the lowest on record with only 26 confirmations on four properties. The effective control of the bont tick *(Amblyomma* sp.) achieved by the almost universal adoption of toxaphene dipping in the heartwater areas is thereby reflected.

The introduction of high-priced exotic bulls of European breeds, which was formerly rigorously avoided, has now become commonplace in these areas.

Sweating Sickness

Low incidence.

Malignant Catarrh (Snotsiekte)

Two outbreaks were reported in areas where no wildebeeste have been seen for years. Twenty deaths occurred and salvaged survivors showed acute pleurisy and peritonitis with one case of fibrinous pericarditis.

Myiasis

This is now a relatively rare condition in European areas but is still noted in remote tribal areas.

Ophthalmia

There is a marked decline in occurrence of this condition, and its control in exotic stock, especially, has been effected by Vitamin A supplementation in winter.

Enterotoxaemia

With the increase in numbers of sheep, notably when they are transferred suddenly to grazing on lush grass leys on tobacco rotations, this condition is becoming a major threat. Vaccination is little practised despite propaganda and heavy mortalities are precipitated by ill-considered heavy dosing with proprietary "worm medicines". One hundred and thirteen cases were confirmed on post-mortem examinations.

Blue Tongue

Very mild incidence.

Pregnancy Toxaemia

Thirty deaths were recorded in one flock of sheep.

Horse-sickness

Only one severe outbreak occurred in the lowveld, Victoria District, on an irrigation project. Elsewhere very few cases were recorded, and total mortality is reported as approximately 20 only.

Febrile Agalactia (Pigs)

With the exception of one piggery with a markedly poor hygienic standard, this condition has definitely decreased in incidence.

Bowel Oedema (Pigs)

This is the main cause of mortality in young weaners, being especially marked in midsummer in the Eastern Districts. The usual badly controlled, sudden dietetic changes seem to be the main precipitating factor.

Virus Pig Pneumonia

This condition in a very mild form, now appears to be confined to the Eastern Districts only, as revealed by a colony-wide survey.

Abattoir checks of lungs have proved unsatisfactory as to proof or otherwise of incidence and some of the most suspicious lungs have come from pigs showing well above normal food conversion rates.

Hereditary Goitre (Calves)

This has been reported in several districts in one particular breed. The condition responds readily to iodine therapy.

Rift Valley Fever

This was diagnozed by a private practitioner, as the casual factor of 12 abortions in cattle in the Salisbury District.

Brucella ovis

This has been confirmed in rams as a sporadic infection, and a colony-wide survey is being organized to check its factual incidence. Abortions in ewes in affected flocks are significant economically.

Verminosis

Lack of regular routine dosing and last-minute recourse to highly advertised "new" anthelmintics, once herds are heavily infested, have materially contributed to losses from this source.

Steadily maintained propaganda has resulted in a marked increase in faecal samples examined, but some farmers will not embark on a full dosing programme, mainly on financial grounds.

An unusual outbreak of bovine schistosomiasis was recorded in the Bulawayo District with two deaths following a sanguinary diarrhoea. Marked haemorrhagic areas were found in the alimentary system extending from abomasum to rectum and scrapings from these areas yielded numerous schistosome eggs.

PROTOZOAL DISEASES

Piroplasmosis (Redwater)

This was confirmed on 142 premises, with 112 known deaths. Although this cannot be the complete mortality, there is little doubt that the use of the organophosphate dips is markedly decreasing the incidence of this disease.

Anaplasmosis (Gall Sickness)

This was diagnosed on 230 premises with 98 known deaths. Terramycin usage is definitely lessening the mortality from this condition.

Coccidiosis

This disease is on the increase in bovine weaner stock, 63 outbreaks with at least 80 deaths being recorded before control was established. Incidence in sheep, poultry and rabbits continued at the usual level.

Trichomoniasis

One new centre was confirmed in the Bulawayo District but the infection is soon controlled by cessation of natural service and the use of clean semen by artificial insemination.

DEFICIENCY CONDITIONS

Aphosphorosis

The use of combined blocks of urea and phosphorus as supplementary licks is now widespread and the condition is only reported in breeding herds with poor animal husbandry standards.

The veld supplementation trial with cattle in the Victoria District reported upon last year, continued and results can be summarized as follows:

Pregnancy Diagnosis	*No. of Cows*	*Per cent. Pregnant*
No. supplements—Control Group	6	60
Supplemented—Bone Meal only	9	90
Vitamin A only	4	40
Bone Meal and Vitamin A	8	80
Protein only*	7	78
Bone Meal and Protein	10	100

* One cow has had an ovarian cyst since 15.9.61.

Protein and bone meal groups showed consistent early resumption of oestral activity after calving, on a continuous basis. Control animals and Vitamin A supplemented cows nearly all showed inactive ovaries after calving.

POISONING

Arsenic

Losses from this source approximated 800, 60 per cent. of which were cattle, the remainder being small stock. The careless handling and supervision of poisonous concentrates by farmers in general is marked, despite legislative requirements in this respect. Notwithstanding propaganda, the attitude still prevails and is, regrettably, an open invitation to sabotage.

Lead

Eighteen cattle died as a result of consuming old car batteries, etc.

Fertilizers and Seed Dressings

Thirty-six cattle were killed by licking where bags of these products had burst and spilled.

Hydrocyanic Acid

Twelve bovines died from this cause, mostly on wilting early grazing.

Strychnine

The malicious poisoning of suburban dogs was recorded in Bulawayo, with 14 deaths.

Tobacco Fumigant (Unspecified)

Five cattle were killed by accidental exposure.

ORGANIC POISONING

Dips

Cattle deaths were reduced to 37 head only, showing a better appreciation of the required precautions in their use.

Anthelmintics

With the advent of newer anthelmintics, many containing toxic phosphates, the neglect of cattle owners to read the instructions fully is directly reflected in the ever-increasing death rate following their administration. One hundred and eighty-two head of stock were killed by over-dosing. The most common mistake is administering ounces instead of the labelled dosage of cubic centimetres. Ninety-four sheep were killed similarly and many weaners and calves suffered temporary blindness as a result of overdosing.

FOOD POISONING

Urea

Better control is minimizing deaths from this product, but 53 cattle deaths were recorded. The main contributory factor is placing blocks near water-troughs whereby they become heavily liquified in the surface hollows.

Diplodia

Climatic conditions did not favour heavy grain contamination. Only 44 cattle and 10 sheep deaths were reported.

PLANT POISONING

The midsummer drought and lack of winter rains created lack of green grass in many areas, with the resultant indiscriminate grazing of any available green material, and subsequent poisoning.

Deaths were more numerous than usual and approximately 1,500 head must have died in the Lupane area alone from *Dichapetalum* sp. (M'kauzaane) plus some other toxic veld factor as yet not isolated. Similar deaths occurred on the Gwaai ranches.

Senecio sp. in the Eastern Districts and *Urginea* sp. in the Midlands Districts precipitated many deaths, in aged stock especially.

Two hundred and eighty-two post mortems in other districts disclosed the following species—anthericum, cestrum, datura, scilla, lantana, pteridium and melia.

One hundred and fifteen deaths were attributed to plant poisonings in which no specific diagnosis could be established.

ARTIFICIAL INSEMINATION

Two centres were operated at Bulawayo and Gwelo by the Field Branch.

Returns	*1961/62 Inseminations*	*1961/62 Doses Sold*	*1960/61 Inseminations*	*1960/61 Doses Sold*
Gwelo	992	250	807	138
Bulawayo	1,645	437	2,301	209

Conception rates averaged 71.4 per cent. in Bulawayo and 68.3 per cent. in Gwelo. The inclusion of a vibrio foetus infected herd in the Gwelo returns resulted in the lowering of the conceptions.

The entire service was run on deep-frozen semen from the Transvaal Artificial Insemination Co-operative, breeds available being Friesland, Jersey, Guernseys and Charollaise. Bulawayo recorded an average of 16.8 miles per insemination in a 30-mile radius, compared with Gwelo's average of 11.7 miles.

The steady fall in inseminations in the Bulawayo area reflects the decreasing support for a centralized scheme with its high costs per calf, due to the scattered range of herds using it and the attendant high mileages travelled.

It is obvious that artificial insemination can only become economic if farmers will combine into small co-operatives and employ their own inseminator.

The Government scheme has fulfilled its primary purpose as a disease control measure, with the virtual disappearance of contagious epddidymitis and vaginitis in dairy herds, but it is becoming very apparent that artificial insemination should be taken over by the dairy farmers themselves if the best economic use is to be made of it as a measure to improve dairy stock.

Increasing use of district offices as diagnostic centres is reflected in the following returns:

Smears Examined	*Post-mortems Performed*	*Biological Samples Examined*
25,938	738	2,931

MEAT INSPECTION

The activities of the Senior Meat Inspection Adviser, Mr. H. Thornton, who is an authority of international standing on the many problems of meat hygiene and the author of two standard works on meat inspection, have been centred on the four slaughter plants conducted by the Cold Storage Commission in Southern Rhodesia. He has carried out a thorough investigation into the suitability of the construction and layout of these premises, and the system and practice of meat inspection as performed by Federal meat inspectors on those premises and the hygienic handling of meat, carcases and offals.

Very considerable progress has been made and has formed the basis of a progress report which has been submitted to the Ministry of Agriculture.

STOCK SLAUGHTER FIGURES

	Cattle	*Pigs*	*Sheep and Goats*
Salisbury C.S.C.	101,891	73,124	8,911
Bulawayo C.S.C.	107,297	17,897	3,018
Fort Victoria C.S.C.	41,901	8,462	1,316
Umtali C.S.C.	9,703	5,113	2,690
TOTAL	260,792	104,596	15,935
1960–61 TOTAL	239,795	93,809	19,334

CONDEMNATIONS

	Cattle	*Pigs*	*Sheep and Goats*
Salisbury C.S.C.	1,531	210	36
Bulawayo C.S.C.	877	461	6
Fort Victoria C.S.C.	383	68	3
Umtali C.S.C.	84	18	4
TOTAL	2,875	757	49

MAIN REASONS FOR CONDEMNATION

	Cattle	*Pigs*	*Sheep and Goats*
Emaciation and Oedema	800	19	42
Measles	567	109	—
Sarcocysts	244	26	—
Bruising	87	6	—
Pyaemia	45	26	3
Pleurisy and Peritonitis	184	16	—
Tuberculosis	2	6	—

Measle incidence (detained for freezing), 3,578 carcases.

CATTLE CENSUS AND DIPPING TANKS

	European	*Native*	*Total*	*Dip Tanks*	*Spray Races*
Bulawayo	382,816	430,802	813,618	1,200	84
Salisbury	385,730	351,548	737,278	1,472	455
Gwelo	288,832	280,176	569,008	885	65
Fort Victoria	224,286	461,447	685,733	735	87
Umtali	75,938	168,317	244,255	501	108
Chipinga	53,279	57,092	110,371	232	16
Gwanda	122,253	263,419	385,672	363	12
Sinoia	117,814	69,714	187,528	358	132
TOTAL	1,650,948	2,082,515	3,733,463	5,746	959

IMPORTATIONS

	South Africa	*Northern Rhodesia*	*United Kingdom*	*United States of America*
Bulls	164	—	3	7
Cows	802	223	—	—
Heifers	61	—	—	—
Oxen	—	—	—	—
Calves	378	—	—	—
Mares	104	—	—	—
Stallions	59	—	—	—
Geldings	433	—	—	—
Mules	107	—	—	—
Donkeys	483	—	—	—
Pigs	10	—	—	—
Sheep	247	—	—	—
Goats	51	—	—	—

Bovine 1,405; Equine 1,186; Porcine 10; Ovine and Caprine 298.

Slaughter Stock:	*Bechunaland Protectorate*
Cattle	5,843
Pigs	275
Sheep	52

EXPORTATIONS

	South Africa	*Northern Rhodesia*	*Nyasaland*	*Mocambique*	*Congo*
Bulls	1	86	1	17	2
Cows	—	120	8	143	—
Heifers	—	81	5	40	24
Mixed Cattle	—	946	—	—	—
Oxen	—	645	—	6	—
Calves	—	9	—	15	—
Mares	3	29	—	—	—
Stallions	2	1	—	—	—
Geldings	8	76	1	1	—
Mules	—	1	—	—	—
Donkeys	—	37	—	—	—
Pigs	1	23	—	1	—
Sheep	—	112	—	—	—
Goats	—	6	—	—	—

Bovine 2,149; Equine 159; Porcine 25; Ovine and Caprine 118.

Slaughter Stock:	*Northern Rhodesia*
Cattle	111

VETERINARY RESEARCH BRANCH

STAFF

The situation of professional staff became extremely difficult during the year. Dr. D. K. Shone resigned from the service in May, having been on the staff for ten years, and his departure has been a considerable loss to the Branch.

Dr. J. R. Philip, on three years' study leave, continued his studies during the year at Davis University, California.

Although the establishment was increased in July, 1961, to include a pathologist, a poultry specialist and a pig specialist, it has not yet been possible to recruit professional men to fill these posts. A new post of Veterinary Zoologist has also been established, in order to investigate the disease relationships between game and livestock.

The Assistant Director of Veterinary Services (Research), attended a course on infertility of Farm Animals held at Muguga, Kenya, under the auspices of the Inter-African Bureau for Animal Health and presented a paper on the nutritional aspect of infertility in ranch cattle. He also attended a subsequent meeting on post-graduate veterinary education in Africa at the same venue.

Mr. J. B. Condy throughout the year gave considerable assistance to the Department of Wild Life Conservation in the capture of wild animals such as rhinoceros and buffalo, advised on drug mixtures for immobilization of large wild animals and acted as veterinary adviser to the operation White Rhino (transport of eight white rhino from the Republic of South Africa to Southern Rhodesia).

Members of staff gave lectures at the Gwebi Agricultural College on scheduled diseases.

ROUTINE SERVICES

The Branch provides routine diagnostic services for the staff of the Field Branch, for the veterinary practitioners and for farmers and material for diagnosis is forwarded from all parts of the country.

In order to widen the use of this facility, all veterinary officers throughout the country are provided with suitable specimen bottles, preserving fluids and wooden containers, so that diagnostic material may be conveyed as rapidly as possible to the Research Laboratory. All biochemical examinations and chemical tests for the detection of poisons are undertaken by the Chemistry Branch of the Department of Research and Specialist Services.

Diagnostic Services

A total of 11,795 specimens for diagnosis were received and dealt with by the laboratory during the year as follows:

Blood smears	156
Bacteriological examinations	686
Foetal specimens	109
Blood samples	4,597
Tampons	1,629
Milk samples	1,160
Gall bladders	1,008
Rabies specimens	115
Poison examinations	476
Specimens for tuberculosis examinations	31
Faeces samples	406
Poisonous plant specimens	20
Enterotoxaemia specimens	13
Rift Valley fever specimens	25
Miscellaneous specimens	188
Post Mortem Examinations:	
Poultry	1,052
Rabbits	26
Chinchillas	23
Bovines	7
Sheep	27
Pigs	41
	11,795

Conditions Diagnozed

Brucella abortus:

Sera tested, 4,597; number positive, 310.
Tampons tested, 1,629; number positive, 115.

Vibrio fetus:

Vaginal tampons tested, 1,629; number positive, 249.

Rabies:

Specimens examined histologically, 112.
Specimens examined biologically, 97.
Specimens positive on histological examination, 12.
Histological negative specimens positive on biological examination, 9.

Tuberculosis: specimens examined, 31; number positive 0.

Quarter Evil: specimens examined, 15; number positive, 15.

Mastitis: specimens examined, 1,160; number positive, 375.

Poisoning: specimens examined, 476; number positive, 135.

Rift Valley Fever: specimens examined, 25; number positive, 9.

African Swine Fever: specimens examined, 1; number positive, 1.

Salmonellosis: specimens examined, 1,008; number positive, 3.

Theileriosis: specimens examined, 3; number positive, 3.

Poisoning

Arsenic still remains the cause of heavy losses in stock, especially cattle, and most of the cases can be attributed to carelessness. Unless extensive care is taken with control of dip stocks, etc., such occurrences will be extremely difficult to control, since by the time losses occur considerable damage has been done.

Salmonellosis

The growing importance in world literature of salmonella contamination of meat stimulated a bacteriological survey of gall bladders of animals passing through the Cold Storage Commission works. One thousand and eight bile samples were cultured for the presence of salmonellae but only three positives were recorded.

African Swine Fever

Heavy mortality in pigs in the north-eastern corner of the country was diagnosed as African swine fever. Biological tests conducted at the Research Laboratory supported the histological diagnosis obtained at the Onderstepoort Research Laboratories in the Republic of South Africa on examination of the peri-portal lymph glands from natural cases.

Four pigs were inoculated with two sets of suspect material, and all died within six days, showing post mortem lesions considered to be typical of the condition.

Bacillary White Diarrhoea Antigen

The antigen is prepared at the laboratory and supplied to field officers for flock testing. All day-old chick vendors must be in possession of a valid B.W.D.-free certificate which is issued annually by the Department.

Sufficient antigen to test 118,000 birds was prepared and issued.

Pleuro-Pneumonia-Like-Organisms

The initial interest in securing tested flocks now appears to have subsided, only 918 birds being tested throughout the year.

POULTRY DISEASES

A free poultry post mortem service is operated from the Research Laboratory and several visits were paid by staff to poultry farms for disease investigation during the year.

A total of 1,052 post mortems was undertaken during the year, the results of which are tabulated below.

Fowl typhoid	6	Lymphoid leucosis	93
Fowl cholera	50	Neurolymphomatosis	63
Bacillary white diarrhoea	7	Histomoniasis	24
Epidemic tremor	1	Visceral gout	16
Fowl pox	4	Faulty management	75
Coccidiosis	167	Internal parasites	18
Avian respiratory Mycoplasmosis (C.R.D.)	2	Miscellaneous	526

In spite of the availability of numerous coccidiostats, coccidiosis was responsible for a very high proportion of the losses reported among poultry owners. While the established poultry keeper recognizes the importance of early treatment, the back-yard keeper is inclined to suffer heavy losses before seeking a diagnosis.

Lymphomatosis conditions are one of the commonest causes of losses among older birds, no apparent attempts at control being made by chick producers. It is only when reports of heavy losses are made to a breeder that he considers the matter seriously, but little, if any, positive action is ever taken. The suffering purchaser merely changes his source of supply and is apparently satisfied until sooner or later that supply also proves faulty.

This attitude means, of course, that no real pressure to control the condition is ever exerted on the breeder apart from the spasmodic complaints of the occasional egg producer, who appears reasonably content with an offer to replace his losses.

Fowl Typhoid

The policy adopted in the past has been control of the initial outbreak with drug therapy followed up, once the major wave of losses had died down, by a testing-out process with B.W.D. antigen. While this has been utilized successfully for the past few years, there is a growing pressure for the use of one of the newer vaccines. Considerable difficulty in controlling this disease is experienced because of the failure by African poultry owners to report the condition, and because of their habit of selling sick birds as quickly as possible thus disseminating the disease further.

Fowl cholera, where outbreaks are controlled by slaughter and compensation, is spread in similar fashion.

PREVENTIVE AND CURATIVE SERVICES

Vaccines

	1962	*1961*	*1960*
Anthrax vaccine	48,160	174,078	282,380
Bluetongue vaccine	9,850	20,000	7,400
Calf paratyphoid vaccine	7,795	7,281	4,820
Calf paratyphoid vaccine for use in adults	272	473	290
Contagious abortion vaccine	97,932	86,427	89,494
Enterotoxaemia vaccine	19,400	5,650	—
Fowl-pox vaccine	431,100	485,180	410,800
Gallsickness vaccine	22,670	18,885	15,520
Redwater/Gallsickness vaccine	9,248	8,133	9,666
Horse-sickness vaccine	6,062	5,370	4,771
Lumpy-skin vaccine	145	175	—
Quarter-evil vaccine	483,980	475,330	664,390
Quarter-evil–malignant oedema vaccine	89,020	55,380	55,150
Rift Valley Fever vaccine	—	550	50

Remedies

Nodular worm remedy, 326 tins.

Considerable publicity has been given during the last two or three years to the necessity for vaccination of cattle against diseases especially with quarter evil vaccine and with contagious abortion vaccine. It is interesting to record, therefore, that while contagious abortion vaccine has now reached a record total of just under 98,000 doses used, quarter evil vaccine has not recovered the ground lost since 1960, sales being in the region of 484,000 doses.

Following outbreaks of *anthrax* a vaccination policy of three successive annual vaccinations is undertaken. The considerable drop in vaccine sales this year as compared with the past two years can be considered, therefore, as a favourable trend following the earlier vaccinations; the number of outbreaks during the year were lower.

Enterotoxaemia Vaccine

A very considerable rise was recorded from 5,650 last year to 19,400 this year. This does not necessarily indicate an increase in the number of sheep, but rather an increasing awareness of the necessity to vaccinate sheep in order to control the condition, which has now been recorded throughout the Territory.

Gallsickness Vaccine

The increasing use of vaccine against this condition represents increased use by the large ranching combines; it is not a vaccine in general use by the ordinary farmer who owns a few hundred head of stock.

Rift Valley Fever Vaccine

The importance of this condition appears to have waned. The disease was most prevalent towards the end of the wet season before the frosts set in.

QUARANTINE OF IMPORTED ANIMALS

Bovines		*Country of Origin*	
Breed:	*United Kingdom*	*Republic of South Africa*	*United States of America*
Friesland	2 bulls	1 bull	—
Jersey	1 bull calf 1 heifer calf	—	—
Ayrshire	1 bull calf	—	—
Guernsey	—	1 bull	—
Hereford	4 bulls	1 bull	—
Shorthorn	2 cows	1 bull	—
Aberdeen Angus	—	4 bulls	—
Brahman	—	—	8 bulls 10 females
Brangus	—	—	2 bulls

All the above animals were tuberculin tested while in the stables.

Other Importation

One Wessex boar was imported from the United Kingdom and two Pietrain boars and six gilts from Belgium.

Vaccination Stables

In addition to 30 imported cattle being vaccinated against redwater and gall-sickness while in the stables, 13 Rhodesian-bred bulls were also vaccinated.

Artificial Insemination

This service has merely maintained the status quo throughout the year. As was pointed out in last year's report, the cost of the service to farmers is the limiting factor. A study of the progress of artificial insemination around the world reveals that its spread has been directly proportioned to the cheapness of the service provided and that, before any notable advancement can be made the service must be indisputably cheaper than natural breeding.

During the year costing of artificial insemination in terms of cost per calf produced was undertaken to compare costs with those applicable in herds using natural service. By natural service, and using bulls of an average value of £135 the cost per calf was £2 10s. The artificial insemination farms surveyed varied from £2 13s. in the case of a herd with really excellent results to £4 17s. where results, for various reasons, were very bad indeed. This supports the contention that any future expansion of artificial insemination in this country is likely to be by the formation of co-operatives operating within a short radius with reduced transport costs, and every opportunity is taken to put this viewpoint to farmers.

On the technical side the biggest advance was the introduction of liquid nitrogen storage of deep-frozen semen. Experiments proved this highly satisfactory for conditions in this country, and much more economical and convenient in use than the present method of storage in solid CO_2. Towards the end of the year techniques of actually deep-freezing semen by the use of liquid nitrogen were tried and found entirely satisfactory.

As previously, deep-frozen semen has continued to be imported from the Transvaal Artificial Insemination Co-operative, which maintains a stud of bulls, representing all the best South African blood-lines, and is second to none. The very high quality of semen supplied has been maintained and there has been no reason to suspect that any bad results were due to semen quality. Complaints have been received from time to time, but these are common to all artificial insemination organizations, and it is definitely not possible to implicate the semen, as excellent results have been obtained in other herds using exactly the same semen.

Field Experiment in Ranch Cattle

During his visit to the country Sir John Hammond reported very satisfactory artificial insemination results following insemination on the fourth and sixth days subsequent to expression of the corpus luteum from the ovary, without detecting heat. The animals concerned were English dairy heifers and the experiment had been made because of the difficulty often experienced in detecting heat in groups of dairy heifers, the management of which is quite different from that of lactating cows and which are often kept at some distance from the farm buildings. The Branch was immediately interested as such a method could be applied to ranch cattle in this country. Approximately 100 suitable ranch females were examined in November, 1961, and corpora lutea were found and expressed in 44 of these (14 cows and 30 heifers). This experiment was almost a total failure, only one animal proving in-calf. As seasonal influences might have been at fault, the experiment was repeated in mid-January, with nearly all the same animals and this time with three inseminations on the third, fifth and seventh days after corpus luteum expression respectively. Results were little better, with only three calves resulting.

CONCEPTION RATES — ANNUAL REPORT

Totals of all Centres per Quarter		*Conception Rates*		*Repeats*			
	C/R%	*1st insemination*	*Non-returns*	*1st insemination*	*Returns*	*Totals*	*Returns %*
July to Sept., 1961	71·7	591	425	591	335	926	36
Oct. to Dec., 1961	61·9	564	348	564	393	957	41·1
Jan. to March, 1961	69·2	583	397	583	293	876	33·5
April to June, 1961	59·5	558	331	558	455	1,013	44·7
Annual Totals of Centres:							
Salisbury	60·4	1,115	673	1,115	642	1,757	36·5
Bulawayo	71·4	701	500	701	583	1,284	45·4
Gwelo	68·3	480	328	480	251	731	34·2
Annual Totals (all Centres)	65·4	2,296	1,501	2,296	1,476	3,772	39·4

OCTOBER 1961 TO SEPTEMBER 1962

Doses of Semen Used	*1961–1962*	*1960–1961*	*1959–1960*
Salisbury Inseminator	2,548	2,226	2,389
Bulawayo Inseminator	1,690	2,301	2,557
Gwelo Inseminator	992	807	886
Salisbury—Sold to farmers	1,367	1,573	2,129
Bulawayo—Sold to farmers	436	209	21
Gwelo—Sold to farmers	251	140	—
Salisbury—Veterinary Department animals	105	71	54
TOTAL	7,398	7,327	8,036

Details of Semen Used			
Doses Friesland semen	5,923	6,152	7,137
Doses Jersey semen	1,300	1,074	883
Doses Guernsey semen	85	19	—
Doses Charollais semen	46	21	—
Doses Ayrshire semen	15	61	—
Doses Red Poll semen	—	—	16
TOTAL	7,369	7,327	8,036

Mileage Covered by Inseminators			
Salisbury	48,376	46,595	44,375
Bulawayo	32,971	37,115	39,247
Gwelo	11,707	8,045	8,436
TOTAL	93,054	91,755	92,058

Revenue	£ *s.* *d.*	£ *s.* *d.*	£ *s.* *d.*
Salisbury	4,179 19 2	3,811 12 2	4,732 1 9
Bulawayo	2,498 12 6	3,189 12 6	3,212 0 0
Gwelo	1,519 17 0	1,160 0 6	1,085 16 0
TOTAL	£8,198 9 2	£8,161 5 2	£9,029 17 9

Trichomoniasis

Investigation of the incidence of this condition was continued during the year, using the vaginal tampon test and the genitalia of bulls from the Cold Storage Commission abattoirs. Experimental work had shown the unreliability of agglutination tests on vaginal material in diagnosing the condition in this country. The organism Tr. foetus has now been recovered, during present investigations from three sources, *viz.* the Matopos Research Station dairy herd, a small dairy herd in the Bulawayo area which appears to have been infected by using ranch bulls, and a large ranch herd in the Umvuma area.

Typing of the three strains showed that they are all of the Manley type, which is very rarely encountered in the United Kingdom. This accounts for the difficulty experienced with agglutination tests as specific agglutinins are not produced by Manley-type strains. Using experimental cattle a diagnostic test depending on demonstration of the actual organism by a culture technique was evolved, and this was applied routinely to all vaginal tampons submitted in connexion with vibriosis and brucellosis diagnosis. In this way the existence of the disease in a small herd in the Bulawayo area unexpectedly came to light.

As a result of these investigations it is now certain that the disease is rare in dairy herds in this country. Since the survey of ranch cattle has not been so extensive and the disease has actually been found on one large property, it is not possible to give an opinion as to its possible incidence in ranch cattle at this stage.

Agricultural Research Council—Bovine Fertility Survey

The situation to date is as follows:

1. *African-owned herds in Southern Rhodesia.*—The survey has not commenced because of political and staff considerations, as previously reported.

2. *European-owned herds in Southern Rhodesia.*—A pilot survey of 12 herds was attempted and this was completed by 30th June, 1962. Altogether, only 10 of the 12 herds were fully surveyed, due to staff shortage. The results are awaiting analysis but impression is that in present circumstances the survey is unpractical and unlikely to produce results of any significance.

The Pathogenicity of Brucella ovis—the casual organism of specific epididymitis of sheep for the bull

Br. ovis was proved pathogenic for the bull by the intravenous and intratesticular routes. Lesions resembling those found in rams were produced and the organism was recovered from infected bulls.

Material from cases of specific epididymitis of bulls is now difficult to find, but all available material will be examined specifically for organisms of the *brucella* type. Material from a herd which is one of the residual hard cases of this condition in this country was obtained in late September, 1962, for this purpose, and more material will be obtained from a similar source early in 1963, when the bulls are slaughtered. This work is being done in conjunction with the Field Branch.

RESEARCH AND INVESTIGATIONS

Low Fertility in Ranch Cattle

Work during the year was confined to two aspects of the problem.

(1) Early weaning.—Previous work has shown that whereas cows without calves at foot achieved a 96 per cent. conception rate, cows with calves at foot only achieved 56 per cent. Investigation revealed that the main cause of this considerable difference was due to lack of ovarian function and it was considered that the milking stress could be the controlling factor.

A trial carried out with a small group of cows, early weaned when the calves were six to eight weeks old resulted in 100 per cent. conception rate within six weeks of early weaning as compared with cows with calves at foot who achieved a 30 per cent. conception rate late in the bulling period. Points of interest were—

(a) the early-weaned cows put on less weight during the month after weaning than did the controls with calves at foot;

(b) the early-weaned calves entered the dry season about 80 to 100 lb. lighter than the late-weaned calves.

(c) conception resulted from every service in the early-weaned group.

A further check in early weaning, where three- and four-year-old Afrikander first calf at foot heifers on Charter Estates were used in an early-weaning trial, confirmed the above findings of increased conception rate and over four groups of heifers with calves at foot showed an average of increased conception rate of 59 per cent. over control animals whose calves were weaned at the usual time.

(2) Carbohydrate Feeding.—Work at Matopos in 1932 showed increased weight gains on green grass where steers were fed mealie meal as compared with those not so fed. Nebraska University workers showed that a high-energy ration was an important factor in the control of ovarian cycling after parturition. A group of heifers with calves at foot fed carbohydrate supplementary ration for the first two months of the bulling season showed a 30 per cent. conception rate compared with a nil conception rate in the controls. The calves of the fed group put on, during the period of feeding, 22.51 lb. more weight than those of unfed mothers, suggesting that (a) unsupplemented veld grazing was not sufficient to allow those cows to express their full genetic capability for milk, or (b) the addition of a readily assimilable carbohydrate to their ration enabled the experimental animals to utilize the protein in the grazing more effectively. The fed cows at the end of the feeding period weighed an average of 33.86 lb. more than the unfed. However, during the first month of feeding there was only 1 lb. weight on the average difference between the fed and unfed, although there was a 12 lb. difference on the average between the calves of the two groups. It is felt that better results would have been achieved had the feeding taken place earlier in lactation.

Vitamin A

Although many thousands of ranch cattle are supplemented during the dry season with Vitamin A and good results are claimed by some users, no figures of Vitamin A levels are available for ranch cattle in Southern Rhodesia.

Samples are therefore being taken by the liver biopsy method from a group of six cows throughout the year to obtain the necessary figures so that a better assessment may be made of the necessity or otherwise of Vitamin A supplementation. The final results are not yet available.

Groundnut Toxicity

A further outbreak of this type of toxicity occurred on a turkey breeder's premises causing considerable losses in young turkeys. The diagnosis was confirmed by the Central Veterinary Laboratory, Weybridge, United Kingdom. Further deaths from aflatoxin were confirmed two months later on the same premises, although the ration contained no groundnut but a concentrate made up by a local milling company mixed with home-grown maize from the farm.

Diarrhoea and loss of milk was reported on three premises where the ration contained groundnut, but trials undertaken with some of the suspect material failed to duplicate the symptoms reported.

Calves, sheep and pigs fed on rations containing 25 per cent. suspect groundnut also failed to produce any symptoms of toxicity.

The evidence to date suggests that either the contamination is minimal or the strain of *Aspergillus flavus* contaminating the groundnut is a producer of toxin of low virulence.

It is felt that part of the problem may be associated with the manner of production and storage of this crop which is extremely favourable to propagation of the *Aspergillus flavus.*

Iodine Deficiency

Investigation into calf losses shortly after birth or born dead showed the existence of enlarged thyroid glands indicative of an iodine deficiency. One outbreak occurred on a red soil dairy farm among high-grade Frieslands while the other was an a sandveld ranch among Hereford cattle.

It is thought the above outbreaks were due to a conditioned deficiency rather than an absolute one. In one case the grazing area was on a very highly mineralized belt ("the dyke") which runs in a north-east to south-west direction in Southern Rhodesia. It was in association with this belt that this deficiency was recorded a few years ago in sheep and goats.

PARASITOLOGICAL STUDIES

Fascioliasis

A colony of *Lymnaea natalensis* in the pond in the courtyard of the Research Laboratory continued to breed satisfactorily. They provided a ready source of *F. gigantica* meta-cercariae for experimental purposes. It was interesting to note a very heavy avian trematode infestation in the colony of snails, presumably acquired from doves and other birds when they come to water at the pond.

Longevity of F. gigantica metacercariae

F. gigantica metacercariae dried and kept in the shade for three months were found to be non-infective to sheep.

Molluscicides

It was found that sodium pentachlorophenate, copper-sulphate, and Bayer 73, when used in concentrations necessary to kill snails in the field, have no action on the viability of *F. gigantica metacercariae.*

Sheep Nematodes

A breakdown in worm-free lambs on the Melsetter Pasture Research Station was thought to be due to the feeding of cut pasture and was successfully treated with thiabendazole and phenothiazine before putting them into a pasture which had been free from domestic stock for at least two years.

Work at Grasslands Research Station where worm-free lambs were put out for 10 days of each month with a flock of German merinos to determine the nematode pick-up, showed that this was non-existent under the three-day rotation system being practised.

Blood examinations and electrophoretic examination on the sera have been undertaken on a group of Blackhead Persian and indigenous Nyasa sheep each artificially infected with 5,000 *Haemonchus Contortus* larva, to study the course of haemonchosis and to note any variation in breed susceptibility.

Anthelmintics

Trials with thiabendazole showed its superiority over phenothiazine in the control of a general nematode infection of sheep consisting of haemonchus, trichostrongyles and oesophagostomum.

Promintic was tested on a general nematode outbreak with variable and rather disappointing results.

Hexachlorophene was noted to have no apparent effect on the nematode burden of sheep. Nematodires, which does not occur in Rhodesia, was imported in Corridale sheep from Australia; one treatment with bephenium embonate appeared to clear up the situation.

Trichuris Suis, usually considered to be a relatively benign parasite under conditions in this country, was found to be responsible, on at least three properties, for poor conversion rates and actual loss of condition in pigs between 10 and 14 weeks old.

Parasites in Wild Game

A survey on the Wankie farm reserve showed that nematode infestation had reached a pathogenic level in wildebeeste. Nematode larvae originating from wildebeeste given to two sheep achieved faecal egg counts of 15,000 and 6,000 per gm.—this strain of haemonchus is being maintained at the Research Laboratory. Considerable opportunity was afforded during the year to study internal parasites of game animals because of the various activities associated with game such as Operation Noah and game farming undertakings.

ELECTROPHORETIC STUDIES

Electrophoretic studies are being undertaken on the various game sera collected throughout the year and on cattle sera. The latter samples are being checked in connexion with B-globulin alleles associated with fertility and adaptation. A grant was obtained from the Agricultural Research Council to further this work.

PUBLICATIONS BY MEMBERS OF THE STAFF

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TSETSE AND TRYPANOSOMIASIS CONTROL BRANCH

STAFF

Failure throughout the year to fill three vacancies for professional officers (Entomologists) continued to put a burden on more senior staff and prevented them devoting full time to their proper duties of analysing and reporting on the very large bulk of data now being produced. To a great extent the failure of the Nagupande insecticide operation, the initial stages of which were reported last year, is to be attributed to this cause. The position has been improved, however, by the recruitment of an experienced tsetse entomologist into a senior professional officer vacancy shortly before the beginning of the 1962 spraying season, while the loan of an entomologist by Shell Research Limited for the same season, was most valuable. On the trypanosomiasis side of the Branch the recruitment of a Veterinary Officer with experience in the pathology of game animals to assist the Chief Veterinary Officer (Trypanosomiasis) has been a great asset and has permitted a wide expansion of the Branch's activities. In general, the establishment of lay staff has been kept up to strength and has been increased by the addition of two microscopists.

PROGRESS OF TSETSE AND TRYPANOSOMIASIS CONTROL

General

In spite of the continuing tendency of tsetse-fly to spread rapidly in certain portions of the front, particularly in South Sebungwe (Binga and Gokwe districts) and south of the Lundi River (Nuanetsi District) this has been a most encouraging year. Considerable alarm was felt in April when the spread of infection southward through Lupane District from the Sebungwe fly belt resulted in the diagnosis of trypanosomiasis on the Sotani Ranch, south of the Victoria Falls Road about 120 miles north-west of Bulawayo. This in itself did not represent any serious deterioration of the situation created by the appearance of infection in African cattle at Nduna in March, 1961. However, by this time three *G. mortisans* had been captured in the Shangani area, while in May there were indications of drug fastness at two dipping centres in the same area. The rapidity with which the Branch was able to begin anti-tsetse work was very gratifying. The operations are described below, but it is noteworthy that a very rapid reduction of infections followed the initial clearing and spraying so that the position in the Lupane District is now better than at any time during the last two years. In Chipinga District, also, where from 1952 to 1960 an almost continuous increase in intensity of infection was revealed whenever prophylactic drug cover was lifted, there has been a most spectacular improvement which appears to be associated with the bush-clearing programme at Mwangazi and Lusongo. However, some doubt attaches to this explanation since the politically inspired refusal of cattle owners to permit examination of their cattle for some months in 1961 resulted in failure to collect data during the crucial period.

As always the report year ends with the end of the insecticide campaign season. This year there have been three campaigns and in all of these the initial results are, as usual, encouraging. A noteworthy feature of the largest of these operations, that undertaken in Nuanetsi District south of the Lundi River, was that it was based largely on the results obtained by a pupa survey conducted by a South African team and was carried out as a joint South African-Rhodesian project with Portuguese assistance where spraying teams crossed the international border.

These insecticide campaigns have taken place at points where the pressure of advancing tsetse has been greatest. Elsewhere there has been little change, but it is noteworthy that the expansion of settlement in the Urungwe Reserve appears to have had the desired result, and cattle are now being re-introduced without encountering infection, while test herds on its western border, having been practically free of infection for 21 months, are being moved westwards towards the Sanyati River.

Mention of settlement in Urungwe leads to a consideration of the very encouraging collaboration with the Department of Native Affairs which has become increasingly closer as a result of the activities of the Advisory Committee on the Development of the Economic Resources of Southern Rhodesia and participation of Branch officers in the investigations of Working Party "D" which was set up following the recommendations of the Robinson Committee.

The basis of the Branch's approach to these bodies has been that the only practicable solution to the problem of trypanosomiasis likely to achieve permanence without the unproductive exhaustion of natural resources, is to relate the attack on the disease to the process of land development. It was pointed out that a considerable acreage of land formerly freed of tsetse-fly by game destruction was still unoccupied and the Phillips Report has recommended that these peripheral areas should receive priority, although work on each section of the fly front must be related to its "significance for settlement". Thereafter the programme envisages the development of attack eating into the fly belt along lines indicated by settlement potentiality.

The drawing up of such a programme requires not only an appreciation of local problems of tsetse control and eradication, but also an assessment of settlement potential and costs. The Phillips Report has therefore recommended the establishment of a Tsetse/Settlement Survey Team, to be put into action without delay "to collect information as to the priorities in final fly control and the possibilities of planned settlement in areas peripheral to the main belt". It has also recommended the establishment of an Action Committee to initiate action through the Federal and Southern Rhodesian Ministries of Agriculture. This organization will, at a relatively high level, achieve the sort of co-ordination which is now developing in a most encouraging way at provincial and district levels, particularly in the north-west (Sebungwe) tsetse front.

This aggressive policy will result initially in more cattle coming under risk of infection and great importance, in planning new settlement, is attached to the control of cattle movement by fencing and the provision of adequate facilities for veterinary inspection. The very encouraging results obtained at the Lusulu Field Research Station over the last 15 months give complete confidence that provided these facilities are available, stock can be kept in good health, using standard drug treatments, even in conditions of high challenge, for sufficient time to introduce effective reduction of the tsetse population.

Special circumstances arise where there is no settlement in the neighbourhood of the fly front or where large-scale extended cattle ranching provides a form of land usage which can, by its very nature, contribute little assistance to the task of controlling tsetse fly. Such conditions affect, in particular, the north-eastern and south-eastern tsetse fronts. In the former, however, settlement towards the fly front is expanding satisfactorily, although it has been necessary to initiate bush clearing and insecticide treatments to prevent deterioration of the position during the interim prior to settlement consolidation. In the south-east (Sabi-Lundi basin), while the development, eventually, of the Sabi Irrigation Scheme will provide full defence against tsetse incursion into the cattle areas west of the Sabi, this will take many years to implement. Meanwhile the possibilities for a more rapid follow-up of projected bushclearing, especially around the Turgwe River, are being explored. The situation is still a difficult one, because in spite of the remarkable discovery of the remains of two or three dead specimens of *Glossina*, almost certainly both *G.*

mortisans and *G. pallidipes*, in debris from a bees' nest in a tree rot hole, live flies have not been found. On the southern portion of this fly-belt it has become evident that the advance which threatens the Limpopo basin can only be satisfactorily dealt with by an organization which will correlate and weld into one plan the anti-tsetse operations on both sides of the international border. Proposals have been submitted, by a joint working party consisting of South African, Portuguese and Rhodesian workers, to achieve this object.

CONTROL OF TRYPANOSOMIASIS

Appendix 1 summarizes, for each infected area, the numbers of cattle at risk, with, for comparison, the figures for 1960/61; the numbers of smears taken and of positives recorded and the numbers of inoculations given with various drugs. There is very little difference in the total numbers of cattle at risk when compared with the previous year, but certain local differences require comment. The increase in Gokwe is partly due to the transfer of three inspection centres from Binga. The reductions in Darwin and Mtoko result from the removal from inspection of centres which can be regarded as free of infection. Ndanga, Bikita and Nuanetsi districts are now shown separately instead of being grouped with Fort Victoria, the total increase being caused by the inclusion of 6,780 cattle on European ranches in the Sabi area.

In general the use of drugs is becoming more flexible, with much greater use now being made of berenil, a purely curative drug. This is illustrated by the following figures showing the relative proportions of doses of each drug used in 1960/61 and 1961/62.

	1960/61	*1961/62*
Antrycide Pro-salt	38·0	24·6
Antrycide dimethylsulphate	43·4	31·0
Ethidium	1·2	6·9
Berenil	17·3	32·7
Isometamidium	0·0	4·8
Total	99·9	100·0

Antrycide pro-salt is used purely as a prophylactic in high-risk areas. Antrycide dimethylsulphate is used as a curative having prophylactic properties, as is ethidium. Berenil is a curative with no prophylactic properties and is also used as a sanative. Isometamidium is used as a sanative where resistance to berenil follows resistance to Antrycide. It also has marked prophylactic effects. In general the trend is towards avoidance of prophylaxis where this is possible, since prophylactic drug cover obscures the true incidence of infection. In Appendix II the numbers of smears, positive slides and inoculations are compared over the last seven years. The increase in the numbers of inoculations reflects, on the one hand, the build-up of tsetse-fly density and its tendency to spread and, on the other, the build-up of cattle populations around the periphery of the tsetse-belts. Thus, in Chipinga, which has been one of the most heavily infected areas, African cattle have increased from 15,935 in 1955 to 24,645 in 1962. This increase is also reflected in the number of smears taken. It is of significance, however, that the ratio of positives to total smears has increased steadily, a reflection of the increased efficiency of management of cattle in trypanosomiasis infected areas. In general the procedure is to smear those cattle showing clinical signs of disease or to smear 10 per cent. of any group of cattle (e.g. those from a single kraal or, on occasion, those from all kraals attending an inspection centre). The increased ratio of positives reflects increasing local familiarity with trypanosomiasis risk attached to individual centres as well as, since 1960, the increasing use of non-prophylactic drugs.

CONTROL OF TSETSE-FLY

The following table gives a breakdown of relative costs of anti-tsetse measures. The main weapons of attack are bush clearing and insecticides. The proportion of effort devoted to game destruction (to protect fences only) is now negligible (although next year there will be some increases on account of the Nagupande operation).

	Labour	*Equipment Stores, etc.*	*Transport*	*Total*
Bush clearing and control	17·0	68·3	3·9	42·9
Game destruction	—	0·2	—	—
Surveys and investigations	21·1	1·2	15·0	9·4
Insecticides	5·1	23·5	8·6	15·5
Traffic control	10·2	0·8	5·3	5·9
Fences	9·4	1·1	7·8	4·9
Roads and airstrips	19·2	0·1	13·7	9·4
Camp construction and maintenance	3·9	1·8	5·3	2·5
Administration	12·4	1·8	32·7	7·3
Miscellaneous	1·7	1·2	7·7	2·2
	100·0	100·0	100·0	100·0

TRAFFIC CONTROL

Records show that there has been a marked increase in the capture of *G. mortisans* per 100 units of traffic at the traffic control points. Appendix IV records the captures since 1955. Captures from both cycles and pedestrians have increased since 1957, and from cars since 1958. Part of this increase can be accounted for by the closure of control points that had not been capturing flies for some time but other explanations must be sought to account for the increase in captures from cyclists from 10.66 per 100 in 1959/60 to 33.85 in 1961/62. Considered in the light of information from fly round captures, it is likely that this increase indicates an increase in the general tsetse population. While in some areas this may, in fact, be attributed to the reorganization of game destruction operations in 1955/56, there is good evidence of marked increases in density in areas which were never influenced in this way, e.g. at Rekomitjie, where relative density of *G. mortisans* on fly rounds rose from 19 in 1960 to 87 in 1961 to 156 in 1962.

RESEARCH

The advantages of maintaining a research effort lies not only in the information produced which can be applied to the programme of trypanosomiasis control. The publication of results also has the effect of interesting workers and organizations in other countries. This is already evident at Lusulu where two large drug manufacturers are using the Branch's facilities to carry out trials of new products, while studies at Rekomitjie (and, more recently, at Nagupande) are being made jointly with the Institute of Preventive Medicine in England. The action of Shell Research Ltd. in sending an entomologist to collaborate in the Branch's insecticide work is another example of the links being formed with external organizations.

Within the Federation two other organizations (as well as the Veterinary Departments of the two northern Territories) are concerned with tsetse and trypanosomiasis research. The University College has two full-time research workers, with whom there is close collaboration, while the Agricultural Research Council has, at present, two research workers plus technical staff engaged on the problem and making full use of the facilities the Branch can offer. The presence in the country of workers attached to organizations which are not bound by the practical problems which inevitably impose themselves on Government servants, provides a most valuable stimulus to the professional staff.

Another example of collaborative effort is developing. Having failed, in two successive years, to induce organizations in the United Kingdom to take advantage of the opportunities for scientific study offered by the Kariba game rescue operations, it has been possible this year, with the help of the Research Branch and with the very willing co-operation of the Wild Life Conservation Department, to obtain a very useful series of blood and serum samples from rescued animals, as well as to inoculate blood into rats for infection studies. This kind of work has been greatly extended in the newly-begun Nagupande operation, not only by the Branch's own staff, but by the collaboration of the National Museums. For a period, also, the Branch was fortunate in getting the assistance of a veterinary research worker from the London School of Hygiene and Tropical Medicine. A recent visitor from the Zoological Society of London also expressed interest in this work. By the end of the coming year one may confidently hope for most useful results to begin to emerge. Finally, since these operations are primarily concerned with the investigations on trypanosomiasis and its manifestations in wild game, it has been very useful to establish also an arrangement with the National Parks Department which permits the collection of control samples from animals long out of contact with infection.

CONFERENCES

The ninth meeting of the International Scientific Committee for Trypanosomiasis Research held in Conakry in August was attended by Mr. Ford, in company with the Director.

A working party of representatives of the Governments of Moçambique, the Republic of South Africa and the Federation met to consider the situation which has arisen on the southern fly-front where an advance of tsetse-fly is occurring on both sides of the Moçambique/Southern Rhodesia border, and threatens to invade the Limpopo Valley. The working party felt that this threat called for combined action by the Governments and it is hoped that as a result of their representations, the three Governments will shortly decide to set up an Inter-Governmental Standing Committee to co-ordinate operations in this area.

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AREA REPORTS

1. North-West Front

Binga, Lupane and Gokwe Districts

This front surrounds the largest infested area in Southern Rhodesia. Along the western portion or behind it, within the fly-belt, are several groups of cattle, totalling 5,554 head, mostly belonging to people evacuated from the flooded Zambezi Valley. Although drug resistance occurs, it has been satisfactorily kept in check and at certain centres, e.g. the Lubu Valley, stock numbers have doubled since the cattle moved in in 1957. At present virtually no anti-tsetse work is taking place here, although surveys are urgently needed. The Maseme area, which was the location of a successful insecticide trial in 1960, has now recovered its population of *Glossina* and there are indications of a westward advance. The chief requirement here is the organization of a defence line, such as is now being constructed on the southern portion of the front, which will link up the various isolated groups of settlement with discriminately cleared zones in sections not suitable for human occupation.

Along the southern portion of the front the fly-line runs parallel to and 15-20 miles north of the Shangani River. Since 1955 there has been a very marked and continuous increase in tsetse density as shown by catches at deflying points and on patrols, and this has been reflected first in increasing trypanosomiasis among nearly 10,000 head of cattle watering on the Kana, Shangani and Gwaai Rivers, particularly at the Maganganga and Tjotjolo inspection centres and on the European-owned Karna Block. In March, 1961, infection had reached the Nduna centre on the Bulawayo/Livingstone road in the Gwaai drainage basin and in April, 1962, it had spread to the Sotani Ranch also on the Gwaai. The source of the infection was, without question, the dense population of *G. morsitans* on the headwaters of the Nagupande River 30 miles north of the Gwaai and the route of the advance was via the Dongamusi-Mzola system draining into the Kana and thence to the Shangani River. An attempt to deal with the Nagupande focus by use of insecticide in 1961 was a failure. This failure is attributed to the use of indiscriminate "band" spraying (which, it was hoped, would permit the operation to be carried out with less technical supervision) instead of the selective spraying of features such as tree and termite mound clumps occurring on vleis, rock crevises, ant-bear holes, over-hanging banks and the undersides of fallen trees and the block spraying of heavy riverine areas especially around water holes as had been the method used in the successful Maseme operation a year earlier. A rapid recovery of the fly population after an initial reduction of about 80 per cent. took place. In October, 1961, the first *G. morsitans* was taken at Maganganga; the second in February, 1962, near Tjoljolo and at intervals five more, all being associated with the Shangani drainage.

It was decided in April to extend and intensify anti-tsetse operations to include a bush-clearing programme on the apparently infested portions of the Shangani River and its tributaries. This will take three years to complete. Simultaneously the same river systems are being treated with insecticides during the hot weather. Next in order to reduce and perhaps eliminate the Nagupande focus, this is being subjected to selective game destruction. Finally, intensive efforts are being made to settle the Dongamuzi and Mzola basins.

The programme began on 13th June and the results so far are most encouraging. By the end of September, 21 miles of riverine or associated bush on the Shangani and Maganganga rivers had been cleared, using a labour gang varying from 85 to 100 men. Insecticide spraying in the same area began on 13th August with two teams of four machines each, one north and one south of the Shangani. By 30th September, 7,300 gallons of 3.7 per cent. dieldrin emulsion had been used at a rate of 12 to 14 gallons per machine mile.

In the absence of any control it is not possible to assess results as yet, but it may be noted that positive cases in the Lupane cattle generally, had reached the highest level yet recorded in March (47) which was repeated in June (46), as against a mean level of about 18 cases monthly throughout 1961. A rapid decline took place after clearing began, and only five cases were recorded in September. This reduction took place in spite of the substitution of berenil for antrycide in all inoculations since July.

Considerable discussion preceded the decision to use game destruction on the Nagupande River. It was emphasized, however, that the method proposed was very different from that previously in force in this country and would cover only a relatively small area of 200 square miles. It was proposed to eliminate only six species —elephant and buffalo first, followed by warthog, bushpig, kudu and bushbuck. In order to assist the Branch in carrying out this exercise, the Department of Wild Life Conservation declared the area to be a controlled hunting area to which licensed hunters were admitted during the remainder of the hunting season, from mid-June to the end of September. This would have the advantage of provoking an exodus of certain animals from the area during the period in which the game fence surrounding it was in course of construction. In this phase 16 elephant, 17 buffalo, 5 eland, 8 roan antelope, 20 kudu, 15 impala, 22 warthog, 2 bushpig, 8 duiker and 1 grysbok were destroyed. There is little doubt that this operation was effective in removing the buffalo from the area but not all the elephant. The latter will be removed by officers of this Branch and of the National Parks Department in early October. Thereafter an intensive attack on the four other species named is to be made by 60 African hunters.

The effects of the operation will be watched by a comprehensive system of fly-rounds and traffic control points. Blood meals from captured tsetse will be analysed at the Lister Institute of Preventive Medicine, while the physiological state of the *Glossina* population will be studied at the University College of Rhodesia and Nyasaland. It should be noted that if there is no good evidence of a significant reduction of the tsetse population by September, 1963, the operation will be discontinued. Meanwhile every effort is being made to obtain as much scientific data (whether or not it is of veterinary interest) from the animals destroyed. In addition to departmental veterinary research officers, the National Museums are providing a mammalogist and the part-time collaboration of a veterinary research worker from the London School of Hygiene and Tropical Medicine has been obtained. Studies on haematology and serology and population density will be made and a large collection of skulls, skins and internal organs will be retained for further study.

It is pleasing to record that considerable progress has been made towards the consolidation of settlement along the Dongamuzi and Mzola rivers. This settlement will be extended eastwards and will form a continuous zone from Lubimbi in the west to the Lutope River in south Gokwe in the east. A water supply and roads are under construction and cattle fences are being erected on a plan jointly decided between the departments concerned. The first extension, west of Cewali on the Mzola River has been fenced by the Native Department and cattle have now been moved in.

Gokwe District

The southern portion of this sector, roughly between the Lutope River and the Copper Queen Purchase Area has not in the past been the scene of any anti-tsetse work, since the Charama and Mafungabusi Plateaux had been regarded as forming a natural defence. However, the pressure of *Glossina* has built up here as well and the drainages running off the north and west faces of these plateaux have, in places, served as routes by which *G. morsitans* have now reached the high level ground, giving rise to infections in cattle grazed on the plateau near Gokwe township. It is evident also that the gap between Mafungabusi and Charama has also served as a route for infection southwards to the Sengwe and Lutope Rivers.

Fortunately, this increased pressure of tsetse-fly has coincided with increased pressure for settlement north of the plateaux as well as in the southern portion of the Copper Queen area. In order to achieve the fullest collaboration with the departments concerned in development, the Senior Tsetse Field Officer's station was moved from the Sanyati River in the north of the Copper Queen area to the confluence of the Tari and Sessami rivers in the centre of the settlement area. An entomologist has also been stationed in Gokwe. A road system linking the South Binga portion of the front with the Copper Queen area is almost completed, which will enable the setting up of patrol systems, hitherto non-existent. There is every reason to hope that here, as in south Binga, the fly-front will, in due course, be contained by agricultural development, supplemented, when necessary, by departmental clearing and fencing.

During this phase of development with comparatively large numbers of cattle grazed within or close to the fly-front, pressure of work on the Animal Health Inspectorate is heavy and an additional inspector has been stationed at Gokwe. Of the 14,589 cattle involved, 1,926 are held on prophylactic treatment with antrycide pro-salt. In addition to some 25,000 inoculations given to cattle, 1,386 doses were administered to donkeys.

In the Copper Queen Purchase Area 24 bicycle patrols, two bait-ox patrols and three test herds have been in operation. This intensive cover has revealed pressure of *G. morsitans* further south in the area than had previously been recorded, while a single *G. pallidipes* was taken on the headwaters of the Ungwe River near Chinyenyetu. Two cases of trypanosomiasis were revealed in the test herd on the Marowa River in September, six months after it was installed. This indicates a surprisingly low risk level considering that *G. morsitans* was present, although in low density, on the Marowa headwaters.

Camps, Fences, Patrols, etc.

(a) Eight main field stations are maintained on the north-west front (including the Lusulu Research Station, q.v.).

(b) Seventy-eight patrols by bicycle or with bait-oxen (plus three test herds) are operated continuously.

(c) In addition to the new road system in Gokwe in which planning, supervision and costs were shared with the Native Department, about 500 miles of bush road were maintained by the Branch. The airstrip at Lusulu has been frequently in use.

(d) The game and the cattle fences along the southern portion of the front as well as the Copper Queen game fence, were maintained. In the course of protective work 213 animals were destroyed.

(e) Eight traffic control points were maintained.

2. ZAMBEZI FRONT CENTRAL

Urungwe

Only 24 cases of trypanosomiasis were recorded in the 3,010 head of cattle regarded as lying within the infected area, including ten infections in three test herds on the western edge of the Urungwe Reserve. In addition four sporadic infections were observed on European farms adjoining the Great North Road. There has been continuous, if slow, progress in the restocking of the reserve and the three test herds are to be moved further west to investigate the trypanosomiasis risk nearer to the Sanyati River. Additional fencing was erected within the Reserve by the Native Administration with funds supplied by the Branch.

An extensive system of bicycle patrols, supplemented by bait-ox surveys in suspected areas, indicated little change in the generally satisfactory position throughout the year. A report of increased tsetse density in the Nzou Mine area was investigated, but there was no evidence of any significant change. The mine lies above the escarpment on the road leading up from the heavily-infested Zambezi Valley below.

Kariba

Eight cases of sleeping sickness between December, 1961, and April, 1962, were recorded as having originated in the neighbourhood of the Charara River, which is heavily infested with *G. morsitans* and *G. pallidipes*. In view of the increasing importance attached to the latter species as a vector of human trypanosomiasis it is of interest that an investigation of infection rates showed 0.95 per cent. of a sample of *G. pallidipes* were infected with polymorphic trypanosomes. A sample of *G. morsitans* collected at the same time was negative for polymorphic trypanosomes. An overall survey of this area is desirable and is being considered.

A drug trial herd of cattle is maintained on the Charara River and is discussed in the section on research.

Lomagundi and Sipolilo

It is planned shortly to establish a new camp in north Sipolilo. This is in anticipation of developments likely to take place in the Dande Special Area, two-thirds of which are tsetse-infested. This new station will also provide a centre for surveys to be undertaken in north Darwin.

Darwin

Some 6,000 head of cattle are subject to inspection in Mzarabani, Chiswiti and Chimanda. Only 38 cases were recorded and 69 berenil inoculations administered. Although these figures are in themselves not at all alarming, the whole region between the Hunyani and Mazoe rivers urgently needs a detailed tsetse survey, since there is evidence of spread of the fly-belts north of the Moçambique border.

Camps, Patrols, Road, etc., in the Central Front

(a) *Camps.*—Five stations are maintained, one west of the Urungwe River, one at Kariba and one at Makuti and the fourth at Chenanga in north Lomagundi. The fifth, Rekomitjie, is dealt with under the section on research. In addition to the proposed station in north Sipolilo there is a need for another to cover the area of unreserved land now being opened for farms on the edge of the fly-belt at Vuti and Manyangau.

(b) *Patrols.*—Fifty patrols are worked regularly, the majority west of the Great North Road.

(c) *Roads.*—Some 200 miles of road and track were maintained throughout the year.

(d) *Traffic Control.*—Four traffic control points were operated.

3. NORTH-EAST FRONT

Mtoko and Inyanga Districts

Last year the presence of *G. morsitans* in the northern portion of the Inyanga North Reserve was established, evidently based on the Ruenya River and its tributaries and providing the source of infection both to about 13,000 head of cattle in that reserve and to some 1,100 head in Chikwizo, in Mtoko District on the north bank of the Ruenya. There is some evidence that infection is spreading in the Inyanga North area and drug-resistant strains have more than once appeared at Fombe and Chimsasa centres. During April a switch was made from antrycide dimethylsulphate to ethidium bromide because of (1) lower toxicity in poor stock and (2) the reappearance of antrycide-resistant strains which were eliminated by iso-metamidium. Four new centres were erected by the Native Affairs Department. New infections were noted in the Nani area of Inyanga North and one case appeared in the St. Swithun's Purchase Area.

The infected areas associated with the Ruenya River are separated from settled areas further north by some 3,000,000 acres of empty land covering the basins of the Mudzi and Nyamsanara rivers. This land will, as a result of modification of the Land Apportionment Act, be settled in due course. These rivers provide access routes for tsetse, but in the absence of livestock there is little indication of trypanosome risk. Tsetse are only caught on them occasionally. Further north still, the heavily populated Mkota Reserve is without cattle. East of Mkota lies Special Area "C". The move towards consolidation of the whole front was begun in 1959 when roads and dams were constructed in this area and trial herds introduced. These herds showed only one positive this year and in April permission was given for introduction of stock to the western half of Special Area "C". By the end of September facilities were almost completed, with four inspection centres and two dips. In due course it is hoped that stock will enter the eastern half of Area "C" and thereafter the re-stocking of Mkota may be contemplated. The whole north-east front area comprises land unsuited to dense settlement and therefore it will be necessary to supplement its effects by clearing, especially of riverine vegetation.

Two operations are in progress. The banks of the Mudzi, Nyamsansara, Nyamapanda and Utsinga Rivers are being cleared where possible by bulldozing. Where ground is too rough manual labour is being used. By 30th September mechanical clearing of both banks of the Mudzi and of the Nyamapanda had been completed, amounting to 1,855 acres at a cost of £9 15s. per acre. Supplementing of this by hand labour raises the cost to £10 4s. 1d. per acre.

The Ruenya River and its tributaries do not, however, lend themselves to mechanical clearing and they, in due course, will be treated manually. Meanwhile, in order both to attempt to reduce the challenge among Inyanga North and

Chikwizo cattle and to test the efficiency of riverine spraying in this type of country, the areas so far shown to maintain a constant population of *G. morsitans* have been treated with insecticides. This work was carried out in September. Riverine vegetation, rocks, logs, and vegetation around cattle dips and lining roads, and covering a distance of 302 miles, measured by cyclometer, was sprayed with 4,850 gallons of 3.7 per cent. dieldrin emulsion. The total area treated in this way was estimated at 92.5 square miles. Costs amounted to 14.4d. per acre, of which 57.82 per cent. was for insecticide, 20.91 per cent. for road construction, 11.24 per cent. for transport and 10.03 per cent. for supervision. Again, the coincidence of the end of spraying with the end of the report year, prevented any assessment of results. It can be recorded, however, that a marked initial fall in tsetse density was recorded. Here, as in the other insecticide operations, bark samples were taken to assess persistence of killing power by the insecticide.

4. SOUTH-EAST FRONT

Melsetter District

Three cases of trypanosomiasis occurred in March in one paddock on the farm Thom's Hope. No further infections have since been noted. There is no danger of establishment of tsetse here, the source of the infection undoubtedly having been the *G. pallidipes* fly-belt some miles east of Rotunda in Moçambique.

Chipinga District

(a) *The Border Clearing and Associated Farms.*—Thirty-one cases, as opposed to 103 in 1960/61, were chiefly associated with the Busi River system. Reslashing of regeneration and grass burning were carried out as usual. Clearing and fencing on the Tamandayi Purchase Area were undertaken. This is part of a joint project with the local administration to enable cattle to be stocked in the area.

(b) *Sabi East.*—This portion of Chipinga District carries some 26,000 head of cattle, most of them grazing in the floor of the Sabi Valley, but in places extending into the edges of the Chipinga highlands. There has been an increase of about 9,000 head since 1955, in spite of two severe epizootics, one in 1954 and the other in 1959/60. In spite of this very obvious evidence of the efficiency of the drug regime, at the beginning of this report year control was virtually at a standstill because of politically-inspired refusals to accept inoculations. It was expected that widespread mortality would result, but this did not happen. Mass prosecutions brought an end to this trouble and inspections revealed a marked fall in incidence of disease. This may have been due to a natural recession, such as appears to have occurred some time between mid-1955 and mid-1957. On this occasion prolonged block treatment with antrycide was lifted and the area remained free of infection for six months. In the present instance, however, after the capture of three *G. pallidipes* near Mwangazi, bush clearing with bulldozers was undertaken, over a period coinciding with the refusal of cattle owners to permit inspection. Whatever the cause of the decline, the incidence of the disease is now lower than for many years.

In addition to the clearing at Mwangazi, which covered 2,927 acres, a further 2,694 were also bulldozed at Lusongo, to form the basis of a barrier to another possible path for a tsetse advance, where there were indications of an invasion from across the border of *G. morsitans,* 20 miles south of the Mwangazi focus. The overall cost per acre was £6 10s. In addition the bulldozer team constructed or repaired 59 miles of roads or tracks at a cost of £18 18s. per mile. Finally, 80 acres of heavy riverine bush near the Sabi in the Musikavanthu Reserve were also cleared for £14 per acre. Complete clearing by machinery was not possible, owing to the rocky nature of some of the land. The remaining areas are being treated by hand, mainly by ring-barking, as and when resources permit. In the Mwangazi area, 362 acres were treated, partly by sheer felling, partly by ring-barking.

No attempt is yet planned to eliminate tsetse in the southern extremity of the Sabi East Area. It has been fenced off and much bush into which tsetse might penetrate has been cleared over the past five years. Patrols around the periphery produce very few flies. Four gates on the border yielded 784 *morsitans* and 74 *pallidipes* as against 1,061 and 162 yast year. At the fifth gate leading out of the tsetse-infested southern portion, 36 *morsitans* and 3 *pallidipes* contrasted with figures of 41 and 1 respectively in 1960/61.

In general, although much remains to be done, the Sabi East situation is satisfactory.

Bikita and Ndanga Districts—Sabi West

This area, lying between the west bank of the Sabi and the north bank of the Lundi, comprises portions of two districts, Bikita and Ndanga. In the former infections continued on Humani Ranch (59) and on the Msapas Section of Devuli

(22). On Humani there was some indication of a spread westwards along the Turgwe River. Although the Humani infections were still low compared with the position prior to the insecticide treatment in 1960, their persistence resulted in a decision to undertake a thorough survey. This extended from March to September and included the use of bait-oxen, traps and pupa searches. .No live flies were found, but what is almost certainly an unique event in the long history of tsetse survey in Africa has served only to make the Humani situation even more enigmatic. Three wings of *Glossina,* two evidently of *G. morsitans* and one of *G. pallidipes* (judged by measurements of wing veins) and, later, the wingless body of a female *morsitans* was found by the Field Officer in rubble below a bees' nest in a hollow *Trichilia emetica.*

Whether or not the source of the Humani and Msapas infections is ever located, there is no question but that elimination of heavy double-storied bush on alluvial soils flanking the Sabi and Turgwe rivers will go far to prevent any further build-up of infection and will be a most valuable safeguard against any advances up the Turgwe, should tsetse ever become established in the area. The problem of regrowth in cleared portions, especially on land in use for farming, is a difficult one. While it may take several years for the regenerating bush to reconstitute a tsetse habitat, the low thickets, which develop very rapidly, may detract from the value of the land (as has indeed happened on parts of the Chipinga border). Accordingly, it has been proposed to treat Humani as a pilot project in which anti-tsetse clearing will form part of a plan to intensify land use and the ranch is now being planned with this end in view by the Conservation and Extension Department. When the plan is completed it will be possible to assess costs, both to land-owner and Government, of development as a whole, of which tsetse operations would form an integral part.

Further south, in the Sangwe and Ndanga East Reserves in Ndanga District, sporadic infections continued at a low level throughout the year, with an intensification at one inspection centre, Rupangwane, which is now being investigated. South of these reserves, the main fly-belt occupies the country enclosed by the Chuhanja Hills, in the angle formed by the Sabi-Lundi confluence. Immediately west of these tsetse-infested hills is the Lone Star Ranch, adjoining the Lundi and Chiredzi rivers. Although this ranch was the subject of bush clearing and insecticide treatment in 1959 and 1960, which eliminated its original infection, it was not to be expected that complete freedom would be maintained since its southern limit is within two miles of the fly-belt edge where *G. morsitans* can be collected regularly, although at low density. Further, the fencing and bush clearing programme in the area is not yet complete. A deflying point was set up at the southern entrance to the ranch in November, 1961. Catches were low (0.8 flies per month) until August, when seven were taken. Already, however, in June, infections were diagnosed and by September, 126 were recorded. Cattle, save for two herds of 25 left as test herds, were removed after treatment to another portion of the ranch. A tsetse survey in the neighbourhood of the original infections showed the presence of a few *G. morsitans* over the junction of two drainages, the Mahande and Chiloveka, with the Chiredzi. Apparently significant bush was sprayed with D.D.T. during the second half of July, but without subsequent effect on the infection rate. However, further survey work showed that although no tsetse could be caught on the portion of the drainages covered by the spraying, they still persisted in low density on the headwaters. Arrangements were therefore made to spray the whole of these drainages in October. Strong circumstantial evidence suggested that movement of elephants between the Chuhanja Hills and the Chiredzi-Lundi confluence may have been responsible for this appearance of *G. morsitans* on Lone Star. The movement of these animals is now being controlled by the Wild Life Conservation Department and the owner of Lone Star has been requested to co-operate in this control by the erection of fencing.

Nuanetsi District—South Lundi

At a conference arranged by C.C.T.A. and held in Lourenço Marques in 1961, the problem presented by the southward movement of tsetse-fly on both sides of the international border was discussed, especially in relation to the threat to the Limpopo Valley and the northern Transvaal, including the Kruger Park. In order to assist in survey work the South African representatives offered to send up a team of pupa searchers. This offer was accepted and the team worked both in Southern Rhodesia and Moçambique from November, 1961, to January, 1962, their results confirming the view that breeding of *G. morsitans* was very largely confined to rivers. They were unable to find pupa on the Guluene River on which the first flies had been taken in June, 1961, about eight miles west of the Moçambique border.

As a result of this survey it was decided that an extensive trial of riverine spraying with dieldrin should be carried out as a joint exercise with South African and Southern Rhodesian teams. This began on 5th September, but was preceded by a repetition of the pupa survey work in August. This showed that tsetse were now breeding on the Guluene and at the same time Portuguese workers reported that *G. morsitans* had moved down this river to a point five miles on their side of the border. The exercise was therefore extended to include the Moçambique section of the Guluene and in this area preparatory work was carried out by the Portuguese workers. The programme included the spraying with 3.1 per cent. dieldrin emulsion of 208 miles of riverine bush covering an infested area of 450 square miles, using two teams with four Schefenacker machines each.

By the end of September, two-thirds of the task was completed with very encouraging initial results. On one river on which spraying was completed on 17th September, patrols at the end of the month indicated a population decline of 92.6 per cent. On another a decline of 91.70 per cent. was achieved. It is not possible to predict the degree of success yet, but the results are promising. One object of the experiment will be to see the rate at which the tsetse-fly returns. In certain areas in northern Nigeria it has been found that this occurs sufficiently slowly to obviate the need to construct barriers, so that a programme can be carried on over several years without much overlapping of successively sprayed areas.

It is not yet possible to give costs. By the end of September, 138 miles of the river had been sprayed at an average rate of three miles per team per day, with an average discharge of eight gallons of dieldrex 15T concentrate per mile, i.e. a cost for insecticide of £18 per mile.

The spraying operation did not cover the whole of the south Lundi fly-belt. In the north-west of the infested area evidence was obtained that the continuing advance in the south had been accompanied by an increase in fly density. From October, 1961, to April, 1962, the mean monthly catch at the Chingwedziwa gate varied from 24 to 55. In May this increased to 101. A survey along the road leading from this gate eastwards into the fly-belt showed that the nearest area of heavy fly concentration was in the Sibanja Hills, five miles eastward. A new gate was therefore set up, four miles east of the old gate in mid-June. Catches on the latter dropped to 45, 39 and 40 in July, August and September, while the new gate took 805, 1,039 and 1,006 flies in the same months. These figures support the interesting suggestion that tsetse following bicycles had previously dropped off at the average rate of about 24 per cent. per mile over the four miles between the two gates.

The carriage of tsetse along this road was, doubtless, responsible for the light infestation of *G. morsitans* on the Chingwedzi River from which cattle are infected at the Chambuta and Chingwedziwa centres in Matibi II Reserve. Some 2,300 cattle are involved, among which 67 positives were diagnosed during the year. The Chambuta cattle were block inoculated with antrycide dimethylsulphate on three occasions.

Stations, Patrols, Fences, etc., on the South-East Front

(a) Stations are maintained at Chipinga, at the Sabi Camp in the Ndanga East Reserve, and two at Chipinda Pools, one on the north bank of the Lundi, one on the south. In addition two camps are maintained for periodical visits at Dott's Drift and Hippo Mine on the east bank of the Sabi and at Naivasha, in the centre of the Gonakudzingwa area south of the Lundi.

(b) Bicycle and ox patrols cover the entire tsetse front from Mwangazi south along the border and across the Sabi to Chipinda Pools and thence south of the Lundi to the Portuguese border.

(c) Ten deflying gates are maintained.

RESEARCH STATIONS

Lusulu Experimental Station

The trial of trypanocidal drugs has now run for 15 months and during this period the ranch has been developed.

The whole area was isolated from the surrounding bush by a series of fire-breaks planned from aerial photographs. These were completed in good time and the ranch, at the time of writing, stands as an unburnt oasis in a sea of veld where the only grazing to be found is along a few rivers and in isolated patches.

Cattle

There are 108 head on the ranch including 44 purchased this year in Lupane and Binga Native District.

The calving rate was low because of the absence of a bull until very late in the breeding season. Ten calves were born during the year. Three mature bulls are now running amongst the various groups.

Sheep

Thirty-two head of sheep were sent to the station during the year. Of those 20 head were indigenous type from the Sabi area. The death rate, 27, was high, due mainly to gielsiekte. This resulted from grazing on the new but wilted grass following burns. The grass involved is probably a species of *Hyparrhenia.*

Pigs

Four pigs, two gilts and two young boars, were taken to the station initially and their numbers augmented by four stores. The experiment was successful and one of the gilts bred, farrowed 14 and reared nine young. Four were killed shortly after birth as being too much of a burden on the mother. One boar and one store, left as controls, have died from *T. simiae.*

Trypanosome Risk

Assessment of the trypanosome risk on the basis of the average numbers of male and female flies which attacked bait-oxen over the period between 08.30 and 17.30 hours and their infection rate with trypanosomes, determined by dissection, were made over the period April to August. Summarized results indicate that a single ox on a fly-round in the Lusulu portion of the ranch was bitten by infected flies at a rate of 4.0 per hour. The same ox grazing with the experimental herd received 0.8 bites per hour. In the Busi section a single ox received 7.7 bites from infected flies and, grazing with the herd, 3.1 infected bites per hour. These figures are of interest in relation to the berenil indices given below.

Drug Trials

These experiments were continued and extended along the line described in the 1960-1961 Annual Report.

A kraal was built near the Busi River in January-February and the second purchases depastured in that area. Here the trypanosome risk is considerably heavier than at headquarters, where the other groups run, and this was reflected in the results over the next seven months.

Groups of 10 head each in the Busi section were placed on berenil and ethidium, duplicating similar trials at station headquarters. Also at Busi, antrycide pro-salt and prothidium groups were established.

In August a further group was added and is being maintained by the use of a new formulation of antrycide pro-salt.

Results

(1) *Berenil*

(a) At station headquarters the original berenil trial with 10 head was continued throughout the year. A berenil index of 13.7 resulted from this period. This means that cattle in this area can expect 13-14 infections per head per annum.

(b) In the Busi area of higher challenge the index was 16.2.

(c) A group of 10 head was also placed in the Charara River area near Kariba and here the index for six months averaged 15.4.

E. F. Whiteside, of the Kenya Veterinary Department, classified the berenil index as follows:

B.I.	Incidence of trypanosomiasis
1	Low
3	Medium
6.5	High
12	Very high.

Thus it can be seen that the experimental cattle are being run successfully in areas of very high challenge indeed.

(2) *Antrycide-di-methyl sulphate*

In this case a curative drug was being used in an area of high challenge and the results were unexpected.

Long periods—up to 159 days—were noted during which there was aparasitaemia in the presence of regularly positive lymph.

The only parasite noted at lymph node biopsy was *T. vivax* but for varying but often extended periods neither *T. congolense* nor *T. vivax* was noted in the peripheral blood. So variable were these periods of positive lymph and negative blood, ranging from 21-159 days that there appears to be little object in giving average figures. The phenomenon can only be regarded as an interesting manifestation of immunity.

(3) *Ethidium Bromide*

Here again a curative drug was being used in very heavy tsetse challenge and the results were unexpected. Leach, el Karib and Wilmslow in their original assessment of the drug in the Sudan in 1952, stated that a prophylactic period of 1⅓ months in the case of *T. vivax* and 1 month in the case of *T. congolense* could be expected.

At Lusulu headquarters, over the 14 months under review, in a group of 10 head, an average protective period of 87.7 days was noted.

In the Busi River paddocks the mean period of protection in a group of 10 head, over a period of seven months, dropped to 12.4 days in the face of higher risk.

A group is also being run under this drug at Charara but the trial was started later and it is too soon to make a statement. Indications are that the protective period will be between those stated above.

It has been noted in Southern Rhodesia where ethidium was being used as a routine curative drug in the field that in medium challenge the protective period does not greatly exceed eight weeks. This observation confirms the opinion of Leach, el Karib and Wilmslow in the Sudan. The extended protective period experienced at Lusulu may indicate that in addition to the action of the drug, an immunity is developing in the stock in the face of regular and high challenge.

As, in the case of the ADMS group, the periods are very variable, ranging from 21-167 days and showing a definite tendency to shorten.

In all the groups other than the berenil a feature has been the appearance of transient positives. These were of so common an occurrence that early in the trials it was decided that two consecutive blood positives would be the criterion for re-inoculation.

It is now becoming obvious that in some of the cattle at least, this procedure should be varied and treatment carried out only on a clinical basis, perhaps as is done in the case of the sheep on a percentage loss of weight.

(4) *Iso-metamidium (M & B 4180B) (Samorin)*

This drug, regarded as being the universal sanative in cases of drug resistance was given a trial at Lusulu headquarters in 10 head. The results were spectacular giving, for eight head in the first period, a mean of 226 days' protection with a range of from 431 to 58 days.

The local reaction noted at the initial inoculation has varied but has never again been so serious as to preclude the drug from general use. Used as a sanative in the field at both Inyanga (1,300 head) and Binga (1,000), it has proved its worth against antrycide and berenil resistant *T. congolense*. It was necessary to treat at a rate of 2 mpk, 1 mpk failing to remove the drug-fast strain at Siansali (Binga Native District). In every case 4180 B. has eliminated antrycide-fast strains of *T. congolense* even when resistance was at a high level.

As regards the local reaction in local cattle, the available information indicates that this need not be a limiting factor if cattle are well rested and on a reasonable plane of nutrition. No adverse systemic reactions have been noted.

Other Trials

Drug trials with prothidium and antrycide pro-salt were started in the high challenge area at Lusulu, but late in the year, and it is too soon to analyse the results critically.

(1) *Drug Trials in Sheep*

The Black-headed Persians thrived despite showing a constant parasitaemia of *T. congolense* and *T. vivax* within 3½ weeks of running on the station.

In view of the well-marked tolerance to parasitaemia the criterion for treatment was clinical trypanosomiasis as evinced by a loss in weight in excess of 5 lb. and other signs. It became necessary to treat only two head in 12 months in the whole flock. Berenil was used and both animals recovered rapidly, becoming positive again after a short interval.

The indigenous (Sabi) flock of 20 head, introduced to the Busi area of higher challenge in May, were all infected with *T. vivax* in 11 days and all showed a mixed infection within another month. Ninety-five days later there was a sudden loss in weight, clinical trypanosomiasis and two deaths. Treatment with berenil resulted in a rapid improvement.

Whether the higher challenge was the factor which precipitated clinical disease or whether the Sabi sheep are rather susceptible is not yet clear but the trial will continue.

(2) *Drug Trials in Pigs*

Four pigs were transported to Lusulu, two boars and two gilts. One pair was treated with pro-salt R.F. on arrival and one pair treated as controls.

One control was infected in 24 days and the other in 30, both with *T. simiae*. Berenil at 3.5 mpk, even when given daily for five days, failed to cure. A similar failure was noted with A.D.M.S and iso-metamidium. All these drugs suppressed the infection for varying periods.

Antrycide chloride in high dosage had been reported by W.A.I.T.R. as curing and preventing infection. Antrycide pro-salt (old formula) containing a higher concentration of the chloride was next used at a dosage of 20 m.p.k. The results were good and re-infections indicate that at such a dosage the drug might have to be used on a monthly basis to keep a herd clear.

(3) *Future Programme and Summary*

The trials carried out since July, 1961, indicate that with care it may be possible to run cattle in an area of much higher trypanosome risk than was hitherto thought possible. This does, however, require very careful supervision and regular checking.

It appears possible that immune factors operating only when the challenge is high augment the action of trypanocidal drugs and result in a combined effect which might render the running of stock in heavily infected tsetse areas an economic and administrative possibility. It is of interest to note that at no time during the period since the tests started on Lusulu have resistant strains of either *T. vivax* or *T. congolense* appeared. The trials must therefore continue.

The observations on the mixed flock of Black-headed Persian and indigenous (Sabi) sheep show that both breeds have a high tolerance to trypanosomiasis. If the results obtained at Lusulu (the trial must run for a longer period) maintain the promise shown it is certain that small stock must play an increasing part in the livestock economy of tsetse-infected areas and attention should be paid to improving the indigenous breeds by selection and sound management.

It is clear now that as was suspected, *T. simiae* is present in Southern Rhodesia where wild suidae and tsetse exist. Antrycide chloride is successful in controlling infection in pigs but as West African workers have shown, it has to be used in high dosage. These trials should continue for another year to establish the prophylactic period, the economics and the feasibility of keeping pigs in high tsetse density.

Entomological Work

The studies on feeding actitvity and resting sites of *G. pallidipes*, which have now been published, are being repeated on *G. morsitans* at Lusulu. It is hoped to produce a report shortly.

REKOMITJIE RESEARCH STATION

The relations between tsetse-flies, trypanosomes and their hosts

An experiment to investigate the relationship between *Glossina morsitans* and the wild animals available as food hosts, and between the trypanosome infections in *G. morsitans* and the food hosts from which these infections must have originated was started at Rekomitjie in February, 1962.

Two sample sites, representing the wet and dry season habitats of *G. morsitans*, were chosen and a comparison between these two ecological communities is being made with regard to—

(a) seasonal variations in the availability of game animals in the two localities;
(b) variations in the apparent density of tsetse;
(c) variations in the feeding pattern of the tsetse by the identification of blood meals;
(d) variations in the trypanosome infection rates in the tsetse.

The success of the investigation depends on the identification of the source of the blood meals of *G. morsitans*, which are collected monthly in the two sampling sites, and Dr. Weitz of the Lister Institute of Preventive Medicine has kindly undertaken to deal with this side of the work. At the present time only the blood meal analyses for February, the first month of the investigation, are available. These showed that warthog was by far the most important species to *G. morsitans* as a food host, constituting 42 per cent. of the total. Elephant, which are indeed numerous in the area of the investigation, constituted 18 per cent. of the meals and baboon 12 per cent. This latter result is unusually high when compared with the results of workers in other parts of Africa. Kudu and eland together also formed 12 per cent. of the meals and buffalo 9 per cent. Impala and zebra, both present in large numbers in the wet season sampling area, and bushbuck, which are very numerous in the dry season area, were not, apparently, fed on at all.

Seasonal changes in the distribution of potential food hosts were noted. The two sites differ with regard to the availability of species such as elephant, bushbuck, bushpig, rhino, eland, zebra and impala. The former three were, over the period February to September, much more frequent in the semi-evergreen type of vegetation, i.e. dry season tsetse habitat, and the latter were more numerous in the wet season habitat characterized by open mopane woodland. The distribution of warthog and kudu, both, from previous experience, important as food hosts to tsetse, has fluctuated from month to month and it is not yet possible to assess the relative importance of these species in the two types of habitat.

During the months of February to July, the difference in trypanosome infection rate in flies caught in the two sampling sites was not significant. In August and September, however, flies from the dry season habitat showed a higher trypanosome infection rate than those in the wet season area of mopane woodland.

Traps

Trials with a modified form of Harris trap for tsetse flies were carried out at Rekomitjie in February and March. The traps, which incorporate a black screen intended to serve as an attractant, were suspended from convenient branches or poles erected for the purpose—an arrangement which allows of the free swinging of the trap in the wind.

The results of the trials showed that the traps have only a very small attraction for *G. morsitans*, 98 per cent. of the flies caught being *G. pallidipes*. Even with this latter species, however, this type of trap does not attract nearly as many flies as an ox. Nevertheless it is thought that they may serve some purpose in areas of very low density.

Soil Thermograph

Since May of this year a thermograph has been constantly recording soil temperatures in a pupa site typical for *G. pallidipes*, i.e. in a shady area beneath a *Lecaniodiscus fraxinifolia*, a thicket species common in alluvial vegetation in this part of the Zambezi Valley.

The maximum temperature recorded so far is 25.75°C. and the minimum 17.25°C. The diurnal range was greater in July and August than in May and June. The maximum recorded in a Stevenson screen about 200 yards distant was 35.0°C. and the minimum 8.3°C.

SALISBURY LABORATORY

Dissection of preserved tsetse heads

Collections of the heads of *G. morsitans* caught on routine bicycle patrols along the whole Zambezi fly-front are submitted monthly to Salisbury for dissection to reveal the incidence of trypanosome infections. The technique does not allow of the specific or group identification of the trypanosomes found nor does it reveal the presence of salivary gland infections characteristic of the rather rare polymorphic group. It has, nevertheless, provided a survey of the incidence of infections in the vector which may prove useful in assessing the potential danger of various areas with regard to trypanosomiasis. Over 7,000 flies have now been examined.

In Urungwe north flies in the region of Lake Kariba taken from the Gache and Charara river areas were found to be carrying a greater number of infections (23.3 per cent.) than those caught in the escarpment region of Gota Gota, Makuti and Chipitani (13.0 per cent.).

In the Sanyati the incidence in January and February was extremely low (9.2 per cent.), but this rose in the months April to July to 18.8 per cent., a figure which is still not as high as that for the Kariba area.

In the Sebungwe the infections do not appear to vary very much geographically. The incidence in the Kenyandavu-Malimasimbi area was 15.2 per cent., 12.6 per cent. in Lusulu and 15.5 per cent. in the Kariangwe area. However, it should be borne in mind that a survey carried out in the region of the Gwave River north-east of Gokwe in July, 1961, revealed an infection rate in *G. morsitans* of 36.3 per cent. A similar pocket of unusually high incidence of trypanosomes in *G. morsitans* was also found in the region of the Mateswa River, south of the Lundi, in October, 1961, where the rate of infection was 38.5 per cent.

Biometric Studies

Samples of tsetses submitted monthly from various stations within the fly-belts were measured to record changes in size. It has been established (Bursell, E., Bull. ent. Res. 51 p. 33) that the residual dry weight of tsetses (which is for most purposes the best criterion of size) is closely correlated with the area of the thorax represented by the product of the distance between two sets of readily recognizable bristles. While the determination of residual dry weight is an involved process, measurement of distance with the aid of a microscope is simple and rapid. Measurements taken of *G. morsitans* from various areas in October, 1961, showed marked differences in size, and measurements taken from samples from the same area throughout the year indicated seasonal fluctuations. Males were consistently smaller than females at any one time, but the average male in July was larger than the average female in December. Samples of males taken from south of the Lundi River were on average smaller than from elsewhere but were more variable.

A single *G. pallidipes* taken from the south Lundi area was found to be the smallest so far recorded from Southern Rhodesia. *G. morsitans* from this region are also smaller than elsewhere.

Planning

During the year some 2,000 square miles of base-mapping was compiled from templets of air-photographs of the Gokwe District at a scale of 1/40,000 and another 1,000 square miles of Lupane District at a scale of 1/20,000.

Good progress was also made in base lining and tie-pointing air-photographs of the Kariba and Urungwe districts.

The purchase of a Templet Slotter (Radical Secator) greatly facilitated this work.

During the year plans for the following projects were drawn up:

1. The Gokwe-Charama-Sengwa Gorge-Sefula gate road with the Gwave and Tari River links. (Combined project with Native Department, Gokwe District.)
2. The distribution of kraal sites for three test herds and a plan for an ox-patrol coverage in the eastern section of Copper Queen Native Purchase Area (to investigate the apparent rise in tsetse density in the area and to test for the presence or absence of trypanosomiasis—Gokwe District).
3. The Gokwe-Chinyenyetu road (planned for the Native Department).
4. The location of a suitable site for the Kariba drug trial herds.
5. The location of a suitable site for a Tsetse Field Officer's camp in the Sipolilo District.
6. The Shangani-Kana-Mzola-Dongamusi bush clearing in Binga-Lupane districts.
7. The Shangani-Kana-Mzola-Dongamusi insecticide spraying operation.
8. Access tracks and the perimeter game fence line for the Nagupande Shooting Operation, Binga District.
9. Annotation of air-photographs for the South Lundi insecticide spraying operation, Nuanetsi District.

During January, February and March of this year the Survey Ecologist was attached to Working Party "D" when it collected information from districts in which trypanosomiasis or tsetse occurred. The object was to obtain a closer link between proposed Native Department resettlement projects and trypanosomiasis and tsetse control projects.

ACKNOWLEDGEMENTS

The very willing help and co-operation of many departments of the Federal and Territorial Governments throughout the year is again acknowledged. To the Tsetse and Trypanosomiasis Control Branch in particular, the increasing collaboration of administrative, agricultural and land officers at all levels of the Southern Rhodesia Government has been a source of much satisfaction. The Irrigation Department has done much to promote the development of the Lusulu Ranch. To the Departments of Wild Life Conservation and National Parks, much appreciation is also due for their sympathetic understanding of the Department's problems. The Departments of Printing and Stationery and Federal Surveys have both rendered invaluable services to the Mapping Section of the Tsetse and Trypanosomiasis Control Branch. The collaboration with research workers of the Agricultural Research Council and of the University College of Rhodesia and Nyasaland, has been most stimulating.

Finally, the staff of the Department are to be congratulated for the conscientious manner in which they have carried out their duties, often under circumstances of personal danger to themselves.

J. MACKINNON,
Director of Veterinary Services.

10th January, 1963.

APPENDIX I

CATTLE AT RISK, SMEARS, INFECTIONS AND TREATMENTS: BY DISTRICTS

District	1961 Cattle	1962 Cattle	Smears	Infections				Treatments					
				T. congo lense.	*T. vivax.*	Mixed or Other	Total	Antrycide D.M.S.	Antrycide Pro-salt	Ethidium	Berenil	Iso-Meta midium	Total Treatments
Binga	6,757	5,554	5,829	85	12	1	95	6,269	4,047	—	1,239	2,097	13,652
Lupane	9,590	9,648	9,740	236	77	—	313	7,755	—	—	5,572	—	13,327
Gokwe	10,686	14,589	4,655	198	34	23*	255	5,947	12,498	—	6,645	—	25,090
Urungwe . . .	3,010	3,022	3,036	21	3	—	24	—	—	—	170	—	170
Darwin	20,589	6,050	2,543	31	7	—	38	—	—	—	69	—	69
Mtoko	8,052	6,467	825	173	5	2	180	—	—	2,481	1,390	—	3,871
Inyanga	13,032	13,608	2,623	187	26	2	215	3,038	3,729	4,325	4,681	2,689	18,462
Chipinga . . .	22,753	26,190	3,762	114	42	—	156	282	4,116	—	9,651	—	14,049
Ndanga	7,491	9,056	2,279	33	152	2	187	1,617	—	—	3,050	—	4,667
Bikita		3,929	666	2	76	3	81	3,015	—	—	7	—	3,022
Nuanetsi . . .		2,323	934	5	62	—	67	2,905	—	—	—	—	2,905
TOTAL . .	101,960	100,436	36,892	1,085	496	33	1,614	30,828	24,390	6,806	32,474	4,786	99,284

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* Includes 16 *T. bruceii.*, 2 *T. simiae.* and 5 untyped.

APPENDIX II

SMEARS, POSITIVES AND INOCULATIONS, 1955 TO 1962

Year	No. of Smears	No. of Positives	Per cent. Positives of Total Smears	Inoculations
1955–6 . . .	23,028	198	0·9	47,126
1956–7 . . .	27,982	422	1·5	61,561
1957–8 . . .	28,334	578	2·0	69,505
1958–9 . . .	38,734	930	2·4	91,421
1959–60 . . .	51,005	1,398	2·7	115,773
1960–1 . . .	35,714	1,307	3·7	82,260
1961–2 . . .	36,892	1,614	4·4	99,284

APPENDIX III

TRAFFIC CONTROL RETURNS, 1961–62

District	Sp.	CARS				CYCLES				PEDESTRIANS			
		No.	Male	Female	Total	No.	Male	Female	Total	No.	Male	Female	Total
North Urungwe	*m.*	197,461	1,086	929	2,015	10,993	669	414	1,083	20,296	682	697	1,379
	p.		1	—	1		—	1	1		1	1	2
Urungwe Native Reserve . .	*m.*	1,189	1	1	2	2,183	1	1	2	1,775	2	1	3
Mtoko	*m.*	19,454	5	6	11	2,248	17	2	19	2,185	2	2	4
Sabi East	*m.*	586	—	—	—	11,357	88	82	170	58,026	363	287	650
	p.		1	—	1		7	2	9		39	28	67
Sabi West	*m.*	1,340	3	—	3	3,861	19	8	27	7,141	5	3	8
South Lundi	*m.*	625	113	59	172	1,803	1,502	269	1,771	4,208	1,511	298	1,809
Sebungwe	*m.*	6,186	1,920	703	2,623	11,055	9,237	2,415	11,652	12,766	1,869	743	2,612
	p.		—	—	—		—	—	—		—	—	—
TOTAL	*m.*	226,841	3,128	1,698	4,826	43,500	11,533	3,191	14,724	106,397	4,434	2,031	6,465
	p.		2	—	2		8	3	11		40	29	69

m. = *G. morsitans.* *p.* = *G. pallidipes.*

Flies per 100 cars, 2·13; flies per 100 cycles, 33·85; flies per 100 pedestrians, 6·08.

APPENDIX IV

RATES OF CATCH OF *G. MORTISANS.* PER UNIT CARRIER AT DEFLYING POINTS, 1955–1962

	Cars	*G. mortisans.*	*G. mortisans.* per 100 cars	Cycles	*G. mortisans.*	*G. mortisans.* per 100 cycles	Pedestrians	*G. mortisans.*	*G. mortisans.* per 100 pedestrians
1955–1956	183,108	2,633	1·44	109,596	3,205	2·76	174,608	1,683	0·96
1956–1957	181,902	3,666	2·02	134,358	4,094	3·05	218,561	3,092	1·79
1957–1958	195,734	1,554	0·79	141,817	3,392	2·39	265,647	3,338	1·26
1958–1959	203,861	1,264	0·62	87,167	4,542	5·21	207,106	2,778	1·34
1959–1960	153,950	1,006	0·65	47,865	5,104	10·66	131,473	2,268	1·73
1960–1961	167,097	883	1·46	49,978	10,900	21·81	129,471	2,620	2·02
1961–1962	226,841	4,826	2·13	43,500	14,724	33·85	106,397	6,465	6·08